GREAT RIVER ENERGY
And
WRIGHT-HENNEPIN COOPERATIVE ELECTRIC ASSOCIATION

APPLICATION TO THE
MINNESOTA ENVIRONMENTAL QUALITY BOARD
FOR A
ROUTE PERMIT

PLYMOUTH-MAPLE GROVE
115 kV TRANSMISSION LINE

GREAT RIVER ENERGY℠
A Touchstone Energy® Cooperative

Wright-Hennepin
Cooperative Electric Association

September 9, 2003

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ACRONYMS	
AC	Alternating current
ACSR	Aluminum conductor steel reinforced
ACSS	Aluminum conductor steel supported
AF	Forage production
AT	Tilled agricultural land
ATV	All-terrain vehicle
BNSF	Burlington Northern Sante Fe
BPA	Bonneville Power Administration
CD	Creeks and ditches
CFR	Code of Federal Regulations
CM	Cattail marshes
Commission	Minnesota Public Utilities Commission
Corps	United States Army Corps of Engineers
CP	Cooperative Power Association
CR	County Road
D	Developing areas
dB(A)	Decibel
DNR	Minnesota Department of Natural Resources
DOT	Minnesota Department of Transportation
EMF	Electromagnetic fields
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EQB	Minnesota Environmental Quality Board
FEMA	Federal Emergency Management Agency
FF	Floodplain forest
FWS	United States Fish and Wildlife Service
G	Gauss
GPT	Gravel pits and temporary cover
GRE	Great River Energy
HVTL	High voltage transmission line
kV	Kilovolt
LHF	Lowland hardwood forest
L1UBH	Lacustrine Limnetic Unconsolidated-bottom Permanently Flooded
MBF	Upland Deciduous Maple Basswood Forest
MCM	Thousand circular mil
MEM	Mixed emergent marsh
mG	Milligauss
MHS	Minnesota Historical Society
MHz	Megahertz
MW	Megawatt
NAC	Noise area classifications

ACRONYMS	
NESC	National Electric Safety Code
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OF	Oak forest
OG	Open grassland
OW	Open water
PCA	Minnesota Pollution Control Agency
PEMA	Palustrine Emergent Temporarily Flooded
PEMC	Palustrine Emergent Seasonally Flooded
PEMF	Palustrine Emergent Semi-permanently Flooded
PEM/SS1C	Palustrine Emergent Scrub-Shrub Broad-leaved Deciduous Seasonally Flooded
PFO1J	Palustrine Forested Broad-leaved Deciduous Intermittently Flooded flat
ppm	Parts per million
PSS1/EMC	Palustrine Scrub-Shrub Broad-leaved Deciduous Emergent Seasonally Flooded
PUBF	Palustrine Unconsolidated-bottom Semi-permanently Flooded
PUBGx	Palustrine Unconsolidated-bottom Intermittently Exposed
RUS	Rural Utilities Service
RWB	Roadway woodland-brushland
TH	Trunk Highway
UMF	Upland mixed forest
UPA	United Power Association
USDOE	United States Department of Energy
USGS	United States Geological Survey
V/m	Volts per meter
VHF	Very high frequency
WB	Woodland-brushland
W-H	Wright-Hennepin Cooperative Electric Association
WS	Willow swamp
YOB	Yards, ornamental and boulevards

Application for a Route Permit for a High Voltage Transmission Line to Support Increased Load Growth in the Plymouth - Maple Grove Area

Pursuant to Minn. Stat. § 116C.51 to 116C.69 and Minn. Rules pt. 4400.0400 et seq., Great River Energy (GRE) hereby makes application to the Minnesota Environmental Quality Board (EQB) for a Route Permit for a high voltage transmission line (HVTL) in Hennepin County, Minnesota to meet the electrical needs of one of GRE's member cooperatives, Wright-Hennepin Cooperative Electric Association (W-H), for W-H customers located in the Plymouth – Maple Grove area.

GRE and W-H have applied for a Certificate of Need for the project (see Appendix A for documentation) from the Minnesota Public Utilities Commission (Commission). The Commission is expected to rule on that request in September 2003 and to issue an order in October 2003. This Route Application is premised on the Commission approving a Certificate of Need for the proposed 115 kilovolt (kV) transmission line. Should that not occur, this Application for a Route Permit will be withdrawn.

The Application is divided into 14 sections as follows:

1. **EXECUTIVE SUMMARY** – provides background information on GRE and W-H and a brief justification for the project.

2. **OWNERSHIP/PERMITTEE** – describes the proposed ownership of the line and associated facilities (Minn. Rules pt. 4400.1150, subp. 2 A, B).

3. **ALTERNATIVES CONSIDERED** – identifies alternate routes considered by GRE/W-H and the reasons they were rejected (Minn. Rules pt. 4400.2100).

4. **DESCRIPTION OF THE PROPOSED ROUTE** – provides a detailed description of the proposed project (Minn. Rules pt. 4400.1150, subp. 2 D) and line specifications.

5. **ENVIRONMENTAL INFORMATION** – provides a description of the environmental setting, effects on environmental and human resources, and mitigative measures (Minn. Rules pt. 4400.1150, subp. 2E and 2F, and subp. 3), including the identification of land uses and environmental conditions along the proposed route.

6. **IDENTIFICATION OF EXISTING RIGHTS OF WAY** – describes utility and public rights of way along the proposed route (Minn. Rules pt. 4400.1150, subp. 2 I).

7. **ENGINEERING AND OPERATIONAL DESIGN OF PROPOSED HVTL** – describes engineering and operational design concepts for the proposed line, including electric and magnetic fields (Minn. Rules pt. 4400.1150, subp. 2 J).

8. **COST ANALYSIS –** provides cost analysis of the proposed line, including costs of constructing, operating, and maintaining the line (Minn. Rules pt. 4400.1150, subp. 2 K).

9. **DESIGN OPTIONS TO ACCOMMODATE FUTURE EXPANSION** – describes possible design options to accommodate expansion of the line in the future (Minn. Rules pt. 4400.1150, subp. 2 L).

10. **RIGHT OF WAY ACQUISITION AND RESTORATION** – describes procedures and practices proposed for acquisition and restoration of the right of way (Minn. Rules pt. 4400.1150, subp. 2 M).

11. **CONSTRUCTION, OPERATION AND MAINTENANCE** – provides a narrative description of the procedures and practices for construction, operation, and maintenance of the proposed line (Minn. Rules pt. 4400.1150, subp. 2 M).

12. **LIST OF PERMITS NEEDED** – a list and brief description of federal, state, and local permits that may be required for the proposed line (Minn. Rules pt. 4400.1150, subp. 2 N).

13. **SUMMARY** – summarizes the key elements of the Route Permit Application and compares them to the EQB established factors to be considered in evaluating this Application (Minn. Rules pt. 4400.3150).

14. **REFERENCES** – lists documents referenced in the text of the Application and data sources used to generate maps.

The names of each owner whose property is within the proposed route (Minn. Rules pt. 4400.1150, subp. 2G) are provided in Appendix B.

A United States Geological Survey (USGS) topographical map showing the entire length of the proposed route (Minn. Rules pt. 4400.1150, subp. 2H) is provided in Figure 5-1.

1. EXECUTIVE SUMMARY

1.1 General

Great River Energy (GRE) is a not-for-profit generation and transmission cooperative based in Elk River, Minnesota. GRE was created when Cooperative Power Association (CP) and United Power Association (UPA) formed a joint operating company on January 1, 1999.

GRE provides electrical energy and related services to 28 member cooperatives, including Wright-Hennepin Cooperative Electric Association (W-H), the distribution cooperative serving the area proposed to be supplied by GRE's new transmission line (Figure 1-1). The distribution cooperatives, in turn, supply electricity and related services to more than 560,000 residential, commercial, and industrial customers in Minnesota and Wisconsin.

GRE's 2,500-megawatt (MW) generation system includes a mix of baseload and peaking plants, including coal-fired, refuse-derived fuel, and oil plants as well as new wind generators. GRE owns approximately 4,400 miles of transmission line in Minnesota, North Dakota, South Dakota, and Wisconsin.

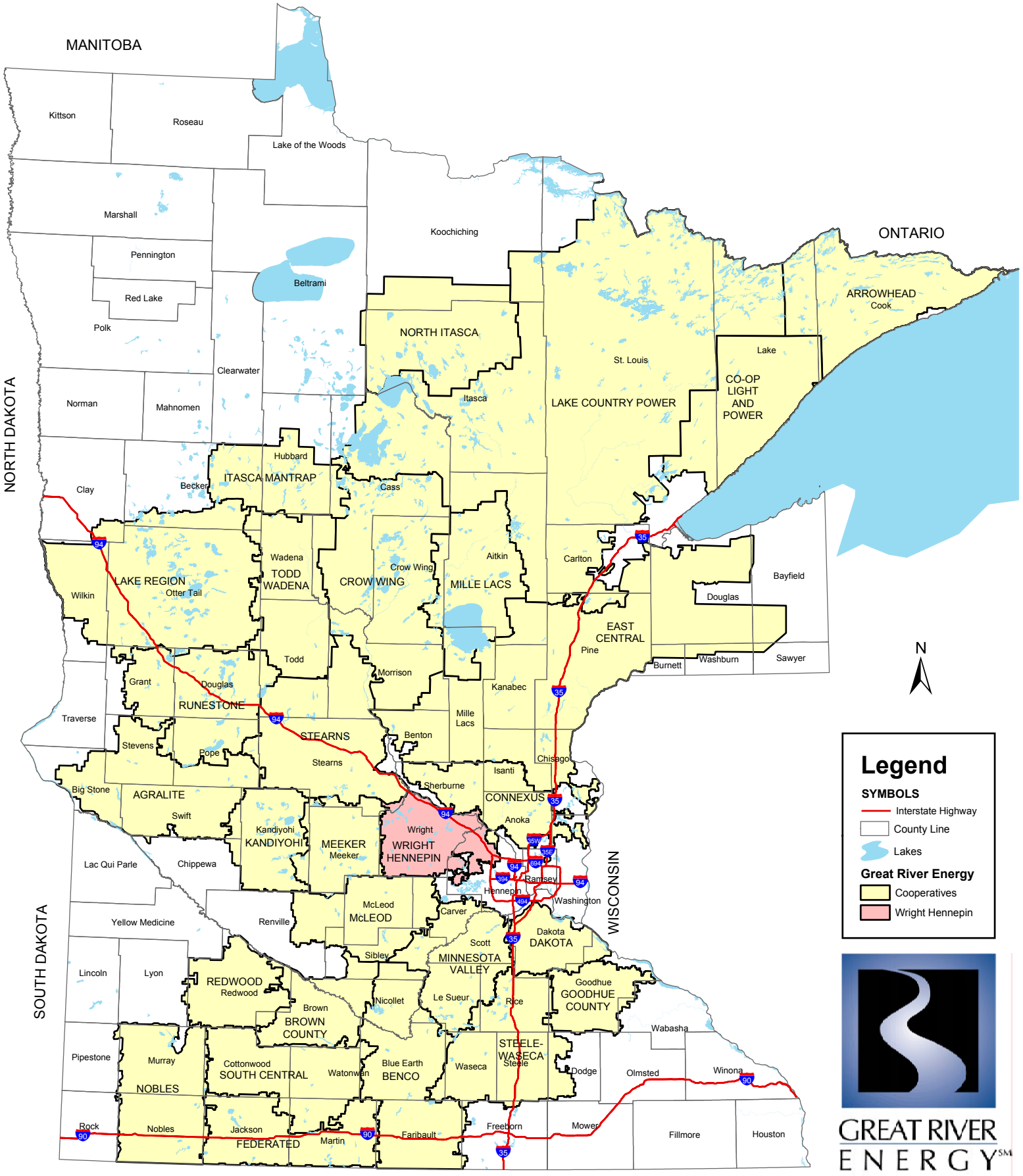
GRE's mission is to provide safe, reliable, competitively priced energy to those it serves. Much of the existing transmission system in the Plymouth and Maple Grove area was designed and built prior to 1975. The electric load in this area (as well as areas further west served by the existing transmission system) has grown to a level that the transmission system is no longer able to reliably serve that load. The benefits of the project described in this route application are that it will put transmission infrastructure in place that will enable GRE to provide reliable energy to W-H's customers in the communities of Plymouth and Maple Grove, and it will also improve the reliability of the portion of the existing transmission system that will continue to serve the western areas.

1.2 Description of the Proposed Project

This Application for a Route Permit is subject to the Minnesota Public Utilities Commission (Commission) granting GRE a Certificate of Need to construct approximately 14 miles of 115 kilovolt (kV) transmission line (Figure 1-2) in the Plymouth-Maple Grove area to meet the growing electrical load in that portion of the W-H distribution area. W-H provides electricity and related services to approximately 34,000 residential, commercial and industrial customers in Minnesota. Approximately 10,503 residential, commercial and industrial customers in the Plymouth-Maple Grove area would benefit from the proposed high voltage transmission line (HVTL).

If granted, the Certificate of Need will authorize GRE to construct a single circuit line designed and operated at 115 kV. This line will connect W-H's Plymouth,Bass Lake, Cedar Island, and Arbor Lake substations and extend to existing 115 kV sources at Xcel Energy's Elm Creek Substation on the north, and Xcel Energy's

Figure 1-1
Great River Energy Service Territory



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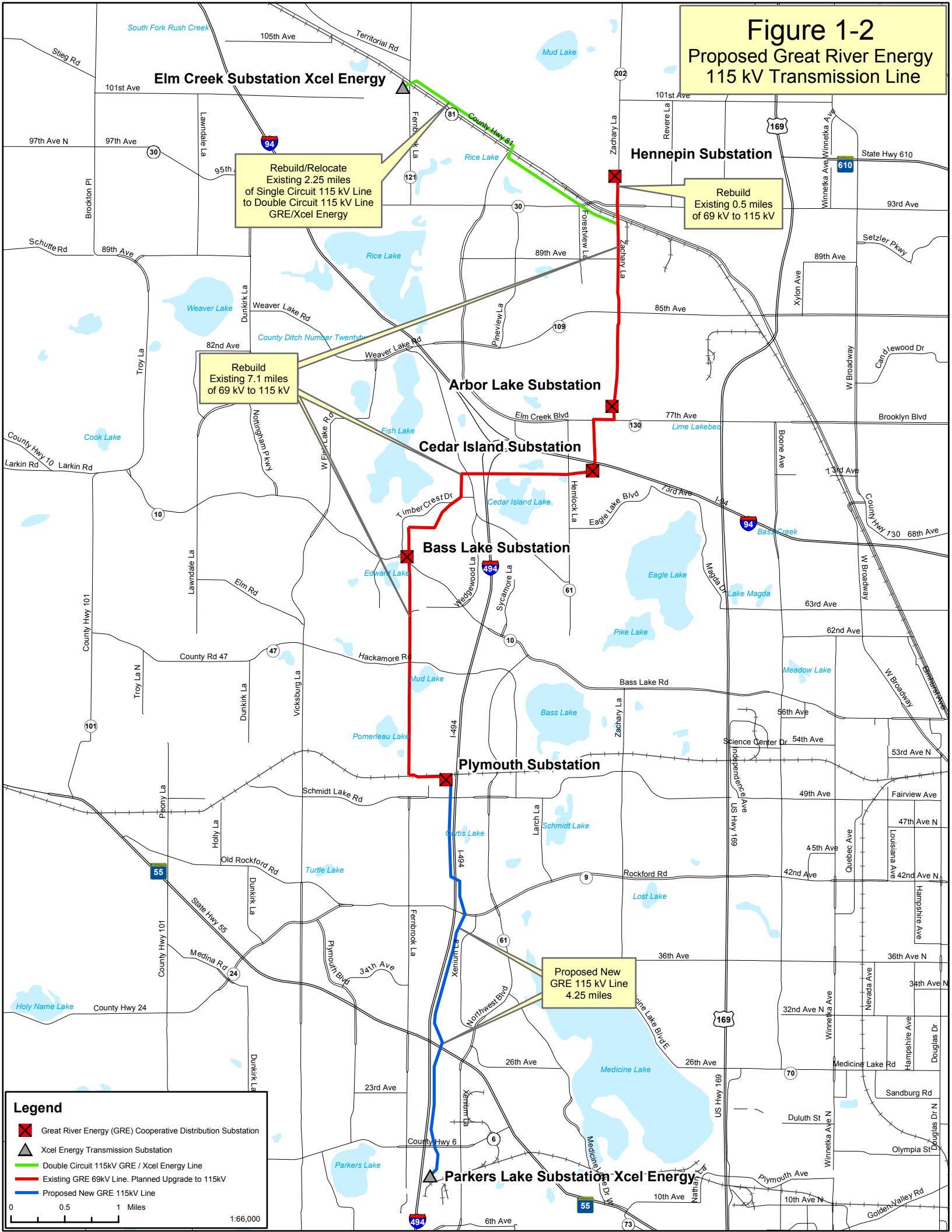


Figure 1-2
Proposed Great River Energy
115 kV Transmission Line
Elm Creek Substation Xcel Energy
Hennepin Substation
Arbor Lake Substation
Cedar Island Substation
Bass Lake Substation
Plymouth Substation
Parkers Lake Substation Xcel Energy
Rebuild/Relocate
Existing 2.25 miles
of Single Circuit 115 kV Line
to Double Circuit 115 kV Line
GRE/Xcel Energy
Rebuild
Existing 0.5 miles
of 69 kV to 115 kV
Rebuild
Existing 7.1 miles
of 69 kV to 115 kV
Proposed New
GRE 115 kV Line
4.25 miles
Legend
Great River Energy (GRE) Cooperative Distribution Substation
Xcel Energy Transmission Substation
Double Circuit 115kV GRE / Xcel Energy Line
Existing GRE 69kV Line. Planned Upgrade to 115kV
Proposed New GRE 115kV Line
0 0.5 1 Miles
1:66,000

Parkers Lake Substation on the south. The proposed line follows existing transmission line routes between the Elm Creek and Plymouth substations, and then generally follows Interstate 494 (I-494) between the Plymouth and Parkers Lake substations. Another GRE member system, Connexus Energy, owns a substation called the Hennepin Substation on the existing 69 kV line. This substation would be radially connected (have only one transmission line serving the facility) to an existing Xcel Energy line, which runs southeasterly from Xcel Energy's Elm Creek Substation to their Osseo Substation.

Specific components of the project are discussed below. Figure 1-2 identifies the location of each of these components.

- Add approximately 2.25 miles of 115 kV line to the existing Xcel Energy single circuit 115 kV line running southeasterly from Xcel Energy's Elm Creek Substation to its intersection with GRE's existing 69 kV line connecting the Arbor Lake and Hennepin substations. The existing Xcel Energy line would be rebuilt from the existing single circuit configuration to a double circuit configuration for this 2.25-mile distance.

- Rebuild approximately 0.5 mile of 69 kV line to 115 kV from the termination of the 115 kV double circuit line described above to the Hennepin Substation. This 0.5 mile of 115 kV line would connect radially to the existing Xcel Energy 115 kV line, which runs southeasterly from Xcel Energy's Elm Creek Substation to their Osseo Substation.

- Rebuild approximately 7.1 miles of existing 69 kV line to 115 kV between the termination of the double circuit 115 kV line described above and W-H's Arbor Lake, Cedar Island, Bass Lake and Plymouth substations.

- Build approximately 4.25 miles of new 115 kV line from W-H's Plymouth Substation to Xcel Energy's Parkers Lake Substation.

- Convert Connexus Energy's Hennepin Substation and W-H's Arbor Lake, Cedar Island, Bass Lake and Plymouth substations from 69 kV to 115 kV.

- De-energize the existing 69 kV line between W-H's Bass Lake and Corcoran substations, GRE's existing 69 kV line between W-H's Plymouth Substation and Xcel Energy's Hollydale Substation, and GRE's existing 69 kV line between Connexus Energy's Hennepin Substation and GRE's Parkwood Substation.

Construction timing for the project is shown in Table 1-1.

Table 1-1 Construction Schedule for Plymouth-Maple Grove HVTL

Year	Project	Miles
2005	Build Plymouth-Parkers Lake115 kV line	4.25
	Parkers Lake Substation modifications	
	Plymouth Substation 115 kV conversion	
2006	Build Plymouth-Bass Lake 115 kV line	2.48
	Bass Lake Substation 115 kV conversion	
	Build Bass Lake - Cedar Island #1 115 kV line	2.35
	Cedar Island #1 Substation 115 kV conversion	
	Build Cedar Island #2 – Arbor Lake 115 kV line	0.37
	Cedar Island #2 Substation 115 kV conversion	
	Build Arbor Lake – Hennepin Tap 115 kV line	1.90
	Arbor Lake Substation 115 kV conversion	
	Build Elm Creek to Hennepin Tap 115 kV line	2.25
	Elm Creek Substation modifications	
Future	Build Hennepin Tap to Hennepin 115 kV line	0.5
	Hennepin Substation 115 kV conversion	

In the above table, the construction of the Hennepin Tap to Hennepin 115 kV line is noted as "future" because Connexus Energy, owner of the Hennepin Substation, has not finalized its date for conversion of that substation to 115 kV.

1.3 Purpose of the Project

The cities of Plymouth and Maple Grove are located in one of the fastest growing areas of the Twin Cities metropolitan area. Population has more than doubled in the last 20 years, as shown in Table 1-2.

Table 1-2 Population Growth in Plymouth and Maple Grove

Year	Plymouth	Maple Grove
1960	9,576	2,213
1970	18,077	6,275
1980	31,615	20,525
1990	50,889	38,736
2000	65,894	50,365

As the population of this area has increased, the electric demand has of course increased dramatically as well. W-H serves the electric needs of much of the Maple Grove and Plymouth area (Connexus Energy and Xcel Energy also distribute electricity to portions of both communities). Table 1-3 shows the customer growth at four W-H substations in the area over the last few years.

Table 1-3 W-H Customer Growth in the Plymouth-Maple Grove Area by Substation, 1998-2002

Year	Arbor Lake	Cedar Island	Bass Lake	Plymouth	Total # of Customers
1998	51	4411	2782	1611	8855
1999	97	5102	2832	1711	9742
2000	18	5272	2853	1950	10,093
2001	268	5107	2950	1962	10,287
2002*	296	5125	2935	2147	10,503

* January through September

The existing 69 kV transmission system serving the area, built in phases mainly from 1954 to 1971, is approaching or has already exceeded its capacity limit. The area's electric load has shown a growth of more than six percent per year over the last several years with moderate growth expected to continue (Table 1-4). This growth would (absent the proposed project) further reduce the existing system's reliability and could lead to potential brownouts, rotating blackouts, and safety concerns due to overloaded equipment.

Table 1-4 Expected Electrical Demand (MW) by Substation

Substation	2001	2002	2003	2004	2005	2007	2012	2026
Hennepin	5.3	5.4	5.6	5.8	5.9	6.3	7.2	10.3
Arbor Lake	6.5	7.4	8.5	9.6	11.0	13.5	18.8	29.8
Cedar Island	23.1	24.5	26.0	27.6	29.3	31.6	35.1	55.7
Bass Lake	16.2	16.2	16.3	16.3	16.3	16.9	19.7	31.2
Plymouth	14.1	13.5	12.9	12.3	11.8	11.8	14.6	23.1
Totals	65.2	67.0	69.3	71.6	74.3	80.1	95.4	150.1
% Growth	0	2.8%	3.4%	3.3%	3.8%	3.9%	3.8%	4.1%

Note: The 2001 and 2002 demand (MW) were expected values rather than actual values.

Although the ultimate growth may vary upward or downward from the projections (these variations were considered by GRE in its forecasting studies), population and customer growth is occurring and GRE must position itself to supply the increased demand without disruption.

While portions of the forecast methodology used by GRE were questioned by the Department of Commerce during the Certificate of Need proceeding, it was determined that any disagreements over forecasting methodologies did not affect the conclusion that the project is needed. The data shown in Table 1-4 are the forecast data provided in the Certificate of Need Application.

If granted, the Certificate of Need will authorize GRE to construct a 115 kV transmission line to serve these four W-H 69 kV substations (Arbor Lake, Cedar Island, Bass Lake and Plymouth) and Connexus Energy's Hennepin Substation.

The issues facing GRE and the EQB are how to site the proposed project to meet the projected need, and provide for the long-term electrical security and stability of the area with the fewest impacts to human and natural resources.

2. OWNERSHIP/PERMITTEE

2.1 Ownership

Xcel Energy is rebuilding the section of transmission line from the Elm Creek Substation to Zachary Lane from a single circuit 115 kV transmission line to a double circuit 115 kV transmission line. Xcel Energy will own the structures and one circuit of this double circuit line, and GRE will own the arms, insulators, and wire of the second circuit.

Xcel Energy will own the substation equipment within their Elm Creek and Parkers Lake substations.

From the intersection of County Road (CR) 81 and Zachary Lane, GRE will own a single circuit 115 kV transmission line that will proceed north to Connexus Energy's Hennepin Substation, and south to W-H's Arbor Lake, Cedar Island, Bass Lake, and Plymouth substations, and then terminate at Xcel Energy's Parkers Lake Substation.

W-H will own the substation equipment within their Arbor Lake, Cedar Island, Bass Lake, and Plymouth substations and their overhead and underground distribution lines.

Connexus Energy will own the substation equipment within their Hennepin Substation.

2.2 Permittee

Great River Energy and Wright-Hennepin Cooperative Electric Association will be named as permittees for this project. Transfer of the permit to any other person or organization is not anticipated.

3. ALTERNATIVES CONSIDERED

In the Certificate of Need Application (GRE and W-H, 2002) and Supplement (GRE and W-H, 2003), GRE and W-H described a number of alternatives to the proposed project to satisfy the increased load demands at the five substations in the Plymouth-Maple Grove area. These included variations of rebuilding the GRE 69 kV system, undergrounding, and new generation (including wind turbines, micro-turbines, diesel generators, and combustion turbines). If the Commission approves a Certificate of Need, it will be because the Commission has considered and rejected these alternatives during the Certificate of Need Proceedings. Readers who wish to see more detailed discussions of these alternatives are directed to the Certificate of Need Application and Supplement.

For the routing process, GRE and W-H put forth considerable effort to find an alignment for the 115 kV transmission line that would have the least impact on human and natural resources. In that process, GRE and W-H evaluated a number of alternate routes, which are described below.

3.1 Routes Considered for the 115 kV Transmission Line

3.1.1 Routing Analysis for Segment 1 – Elm Creek Substation to Plymouth Substation

Four alternates to the proposed route were considered for Segment 1 of the project (Figure 3-1). All of these alternatives would require radial feeds to the substations that need to be served by the 115 kV transmission line. A substation that is fed radially has only one source, which decreases reliability in that a single contingency on the radial line could cause an outage to the entire area served by the affected substation. Thus, all of these alternative routes are less desirable when measured against the preference for routes that are consistent with electrical system reliability, as established by Minn. Rules pt. 4400.3150, K.

In addition to reduced reliability, all of these alternative routes are outside the existing transmission line corridor and would require the acquisition of new right of way, much of which would impact residential properties and occupants. This impact would not be favored under Minn. Rules pt. 4400.3150, A, which gives preference to routes that minimize effects on human settlement and related concerns. It would also be contrary to the provisions of Minn. Rules pt. 4400.3150, J, which promotes nonproliferation by encouraging rebuilding transmission lines on existing electric transmission rights of way instead of creating new rights of way. The concept was articulated by the Supreme Court in *PEER v. Minnesota Environmental Quality Board*, 266 N.W. 2d 858 (1978) where a new transmission line was required to be located on an existing right of way instead of the preferred route.

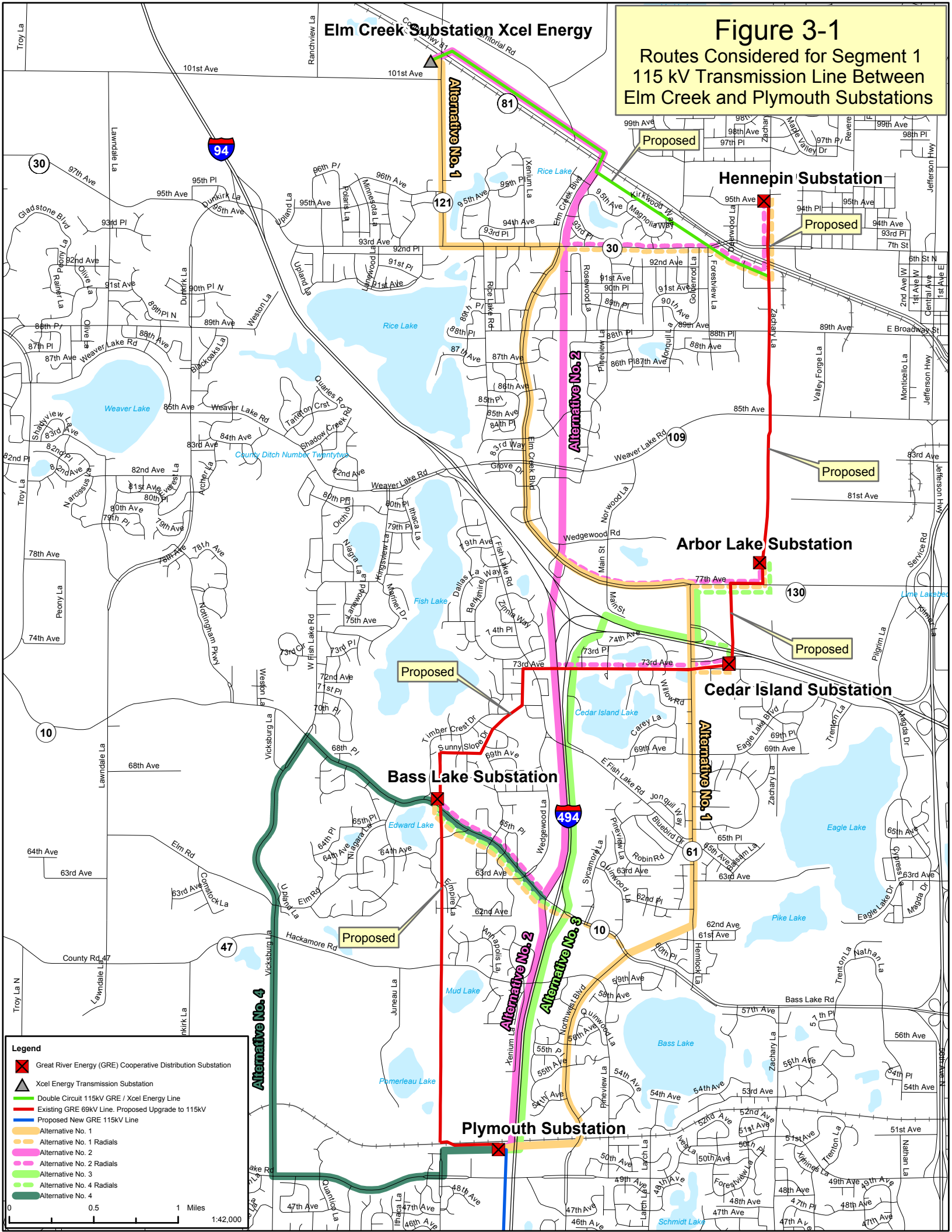


Figure 3-1
Routes Considered for Segment 1
115 kV Transmission Line Between
Elm Creek and Plymouth Substations
Elm Creek Substation Xcel Energy
Hennepin Substation
Arbor Lake Substation
Cedar Island Substation
Bass Lake Substation
Plymouth Substation
Alternative No. 1
Alternative No. 2
Alternative No. 3
Alternative No. 4
Proposed
Legend
Great River Energy (GRE) Cooperative Distribution Substation
Xcel Energy Transmission Substation
Double Circuit 115kV GRE / Xcel Energy Line
Existing GRE 69kV Line. Proposed Upgrade to 115kV
Proposed New GRE 115kV Line
Alternative No. 1
Alternative No. 1 Radials
Alternative No. 2
Alternative No. 2 Radials
Alternative No. 3
Alternative No. 4 Radials
Alternative No. 4
0
0.5
1 Miles
1:42,000

The first alternative exited south out of the Elm Creek Substation along Fernbrook Lane, turned east on CR 30 to Elm Creek Boulevard, south and east along Elm Creek Boulevard to Hemlock Lane, south along Hemlock to CR 61 (Northwest Boulevard), southwesterly along CR 61 to the railroad tracks, and west into the Plymouth Substation. This route was rejected because of impacts to a school, the Maple Grove Arboretum, and many residences along Fernbrook Lane, Elm Creek Boulevard, Hemlock Lane, and Northwest Boulevard. In addition, this alignment would traverse a very busy commercial area south of Weaver Lake Road, resulting in impacts to area businesses. Under this alternative, the Hennepin, Arbor Lake, Cedar Island, and Bass Lake substations would need to be served radially.

The second alternative followed CR 81 east out of the Elm Creek Substation to Elm Creek Boulevard, then turned south and paralleled Xcel Energy's 345 kV transmission line through a number of neighborhoods and a major business development, across I-94 , then south adjacent to Xcel Energy's 345 kV line on the west side of I-494 and into the Plymouth Substation. This alternative was eliminated because there is not sufficient room next to the Xcel Energy 345 kV transmission line to route another line without severely impacting residences and businesses. This alternative would require a difficult crossing over I-94, and radial feeds to the Hennepin, Arbor Lake, Cedar Island, and Bass Lake substations.

The third alternative would use Alternative 1 from the Elm Creek Substation to the intersection of Elm Creek Boulevard and Hemlock Lane. South of this intersection, this alternative would traverse to the north side of I-94, follow westerly along the north side of I-94 for a short distance, then cross to the south side of I-94 at the intersection of I-494 and I-94. From this point, the route would follow the east side of I-494 to the railroad tracks located just north of Schmidt Lake Road, traverse west across I-494 and into the Plymouth Substation. This route was eliminated primarily due to the proximity of residences and businesses, engineering design (size of the structures required), and cost issues with multiple interstate crossings. This alternative would involve constructing radial feeds to Arbor Lake, Cedar Island, and Bass Lake substations that would be costly, impact residences, and require multiple major interstate highway crossings.

The last alternative considered involves a new route between the Bass Lake and Plymouth substations, and would rely on a combination of the previously described alternate routes between the Bass Lake and Elm Creek substations (with radial feeds described above). This alternate route would traverse from the Bass Lake Substation west along Bass Lake Road to West Fish Lake Road, south along West Fish Lake Road to Vicksburg Lane, south on Vicksburg Lane to Schmidt Lake Road, east along Schmidt Lake Road to Fernbrook Lane, north on Fernbrook to the railroad tracks, and east into the Plymouth Substation. This route was rejected because it would require an entirely new corridor with impacts to many residences.

3.1.2 Routing Analysis for Segment 2 - Plymouth Substation to Parkers Lake Substation

Three alternatives to the proposed route were considered for this segment of the project (Figure 3-2).

The first alternative exited west out of the Plymouth Substation to Fernbrook Lane, followed Fernbrook Lane south past CR 6, then angled across I-494 and into the Parkers Lake Substation. This option was eliminated from further consideration because of the proximity to residences, a playground/park area, businesses, and an historic property located along Fernbrook Lane. A distribution line runs along a portion of the route; however, sufficient right of way does not exist for the 115 kV transmission line. As such, new right of way would need to be obtained, which would place the transmission poles in closer proximity to the residences. Existing underground utilities could compound the space problem and further impact the proximity of the transmission line to the residences and businesses. Finally, an historic property, the Plymouth Town Hall built in 1885, is located along Fernbrook Lane and would have to be evaluated in accordance with the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council on Historic Preservation.

The second alternative exited south out of the Plymouth Substation and followed the west side of the I-494 corridor south to just past the CR 6 interchange, then angled across I-494 and into the Parkers Lake Substation. This route was studied very carefully because of an existing, unused Xcel Energy 115 kV easement just west of Xcel Energy's 345 kV transmission line that parallels I-494. However, because of serious encroachments of commercial and industrial businesses into this easement in many areas, routing the line along this alignment would result in the placement of poles in parking lots and loading areas, with transmission lines over the top of buildings (creating possible fire hazards). The line would have to be engineered with large spans and massive structures, which would be very expensive compared to the proposed project. Although impacts to residences would be minimal with this alternative, it was rejected due to impacts to businesses, safety issues, and engineering and cost concerns.

The third alternative considered for this segment exited east out of the Plymouth Substation across I-494, south along I-494 to Schmidt Lake Road, east along Schmidt Lake Road to CR 61, south along CR 61 to CR 6, west along CR 6, and then south into the Parkers Lake Substation. This alternative was eliminated due to proximity to residences and businesses, proximity to a large park operated by the Three Rivers Park District, and engineering considerations (longer length and more angles).

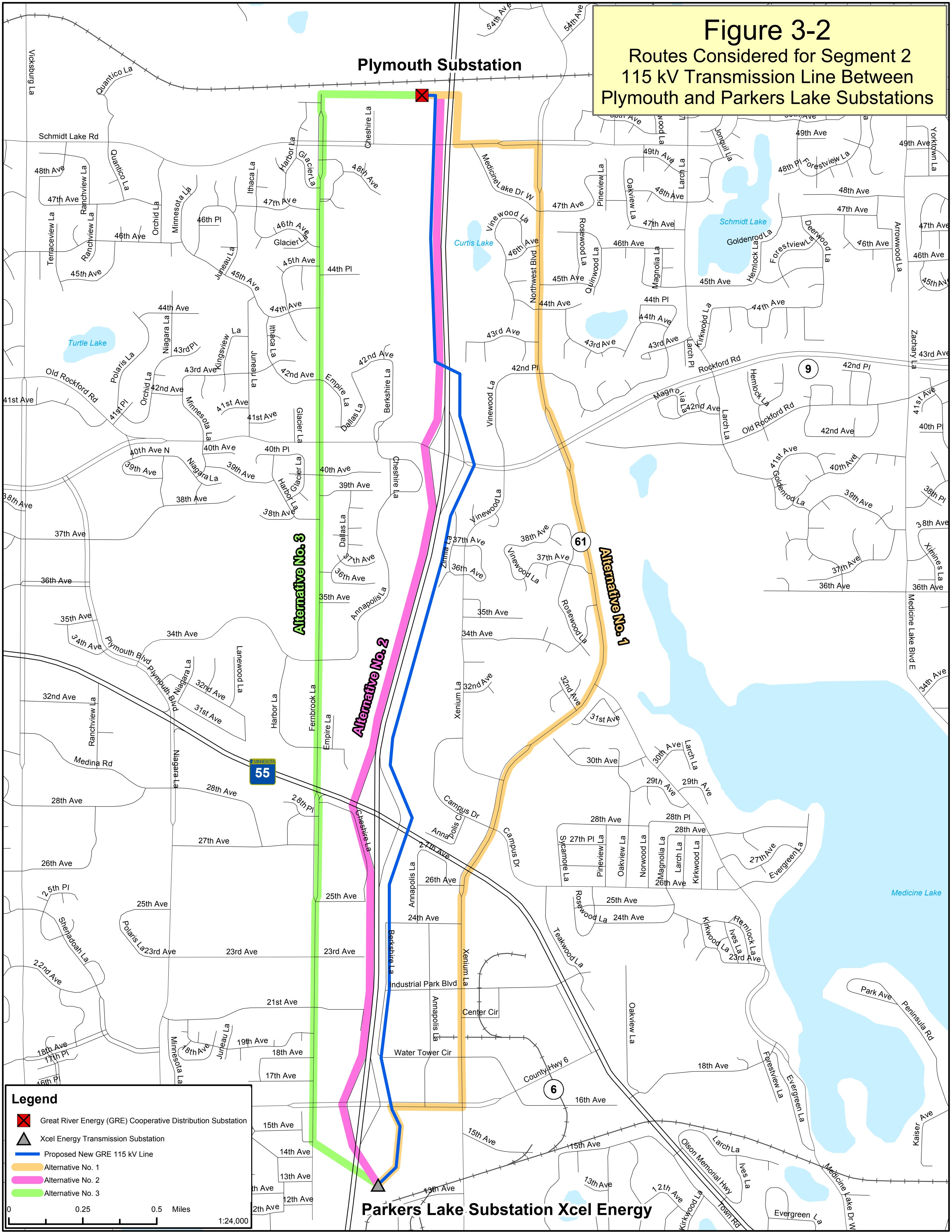


Figure 3-2
Routes Considered for Segment 2
115 kV Transmission Line Between
Plymouth and Parkers Lake Substations

4. DESCRIPTION OF THE PROPOSED ROUTE

4.1 Description of Segment 1 of Proposed Route – Elm Creek Substation to Plymouth Substation

The proposed route between Xcel Energy's Elm Creek Substation and W-H's Plymouth Substation (Segment 1) is shown in Figure 4-1.

The portion of Route Segment 1 from the Elm Creek Substation to the existing Great River Energy 69 kV transmission line located along Zachary Lane would involve rebuilding the existing Xcel Energy 115 kV line to a joint, double circuit transmission line. This portion would generally follow the existing transmission line route along CR 81; however, the route may be modified to accommodate the construction of Trunk Highway (TH) 610. The anticipated route is as follows:

- From the Elm Creek Substation the route would cross to the north side of County Road 81 (TH 610 corridor) and follow in an easterly direction along the north side of CR 81 to a point in the vicinity of the Elm Creek Boulevard/Rosewood Lane. At this point the route would cross to the south side of CR 81 and follow in a southeasterly direction to a point where the route would intersect the existing GRE transmission line located along Zachary Lane.

Once the proposed 115 kV line intersects the existing GRE transmission line along Zachary Lane, the route for the new line would follow the existing transmission line alignment north to the Hennepin Substation and south to the Plymouth Substation. Along this segment of the project, the existing 69 kV line would be removed and replaced by the proposed 115 kV transmission line. This portion of Route Segment 1 is described as follows:

- At the intersection of Zachary Lane and CR 81 the route would follow the existing transmission line alignment south along Zachary Lane to 85th Avenue. From 85th Avenue, the route would continue south into the Arbor Lake Substation. From the Arbor Lake Substation the route would traverse south to 77th Avenue and then follow the north side of 77th several spans where the route would then traverse south, across I-94/694 and into the Cedar Island Substation.

- From the Cedar Island Substation, the route would follow west along 73rd Avenue across I-494 to the intersection of Sunny Slope Drive. At this point the route traverses south along Sunny Slope to the vicinity of Timber Crest Drive where the route crosses a residential area, a pond, and then picks up Sunny Slope Drive. The route follows Sunny Slope Drive westerly and then southerly to the Bass Lake Substation located just north of the intersection of Bass Lake Road (CR 10) and Sunny Slope Drive.

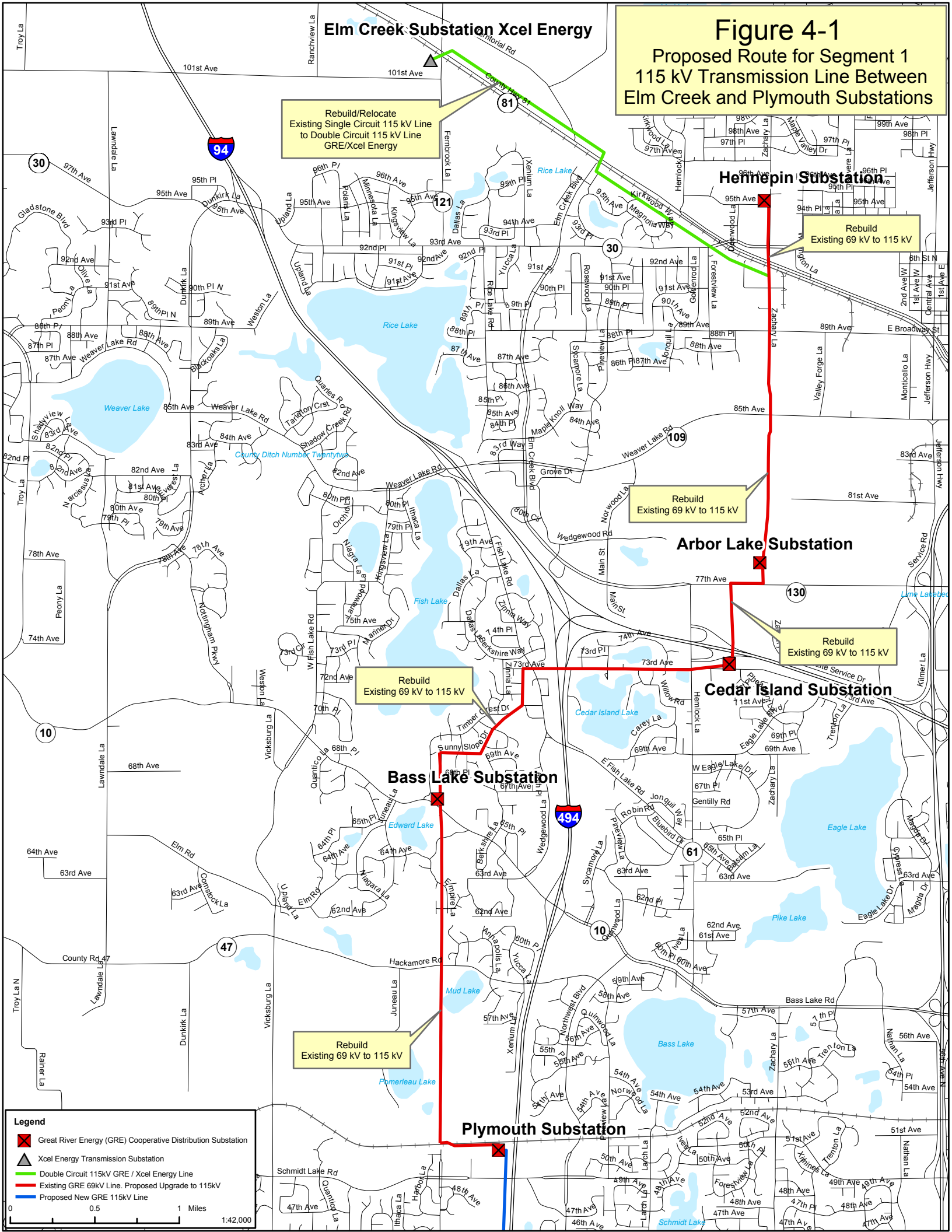


Figure 4-1
Proposed Route for Segment 1
115 kV Transmission Line Between
Elm Creek and Plymouth Substations
Elm Creek Substation Xcel Energy
Rebuild/Relocate
Existing Single Circuit 115 kV Line
to Double Circuit 115 kV Line
GRE/Xcel Energy
Hennepin Substation
Rebuild
Existing 69 kV to 115 kV
Arbor Lake Substation
Rebuild
Existing 69 kV to 115 kV
Cedar Island Substation
Rebuild
Existing 69 kV to 115 kV
Bass Lake Substation
Rebuild
Existing 69 kV to 115 kV
Plymouth Substation
Legend
Great River Energy (GRE) Cooperative Distribution Substation
Xcel Energy Transmission Substation
Double Circuit 115kV GRE / Xcel Energy Line
Existing GRE 69kV Line. Proposed Upgrade to 115kV
Proposed New GRE 115kV Line
0
0.5
1 Miles
1:42,000

- From the Bass Lake Substation the route traverses south across CR 10 continuing in a southerly direction across CR 47 and continuing south across the Burlington Northern Santa Fe (BNSF) railroad located just north of Schmidt Lake Road. From this point the route follows the south side of the BNSF railroad in an easterly direction to the Plymouth Substation.

4.2 Description of Segment 2 of Proposed Route – Plymouth Substation to Parkers Lake Substation

The proposed route between W-H's Plymouth Substation and Xcel Energy's Parkers Lake Substation (Segment 2) is shown in Figure 4-2.

From the Plymouth Substation, located west of I-494 and north of Schmidt Lake Road, the route traverses a short distance east to the existing Xcel Energy 345 kV transmission line. The route then turns south paralleling along the west side of the Xcel Energy line to a point just north of Rockford Road (CR 9) and north of HOM Furniture. From this point the route turns in an easterly direction under the Xcel Energy 345 kV line and over I-494 to a point along the east side of I-494 located northwest of the Target Store. From this point the route traverses south and parallels the I-494 right of way across CR 9, Highway 55, and CR 6. The route then heads east along the south right of way of CR 6 a short distance, turns south across the Carlson parking lot, and terminates in the Parkers Lake Substation.

4.3 Line Specifications

4.3.1 Design Voltage

Design voltage of the proposed project is 115 kV.

4.3.2 Conductors

The proposed 115 kV line would utilize 795 aluminum conductor steel supported (ACSS) conductors. These would provide greater load capacity with less sag than other traditional conductors, including 795 aluminum conductor steel reinforced (ACSR). ACSS provides more current carrying capability than ACSR with comparable structures, poles and appearance. The line would use three single conductors (not bundled).

4.3.3 Length

The 115 kV line would have a total length of approximately 14 miles, with slight variations depending on the exact route chosen. If existing Xcel Energy and GRE transmission corridors are utilized as proposed, the project would require only 4.25 miles of totally new right of way, most of which would be in the existing I-494 corridor. The entire line and associated facilities would be within Hennepin County, Minnesota.

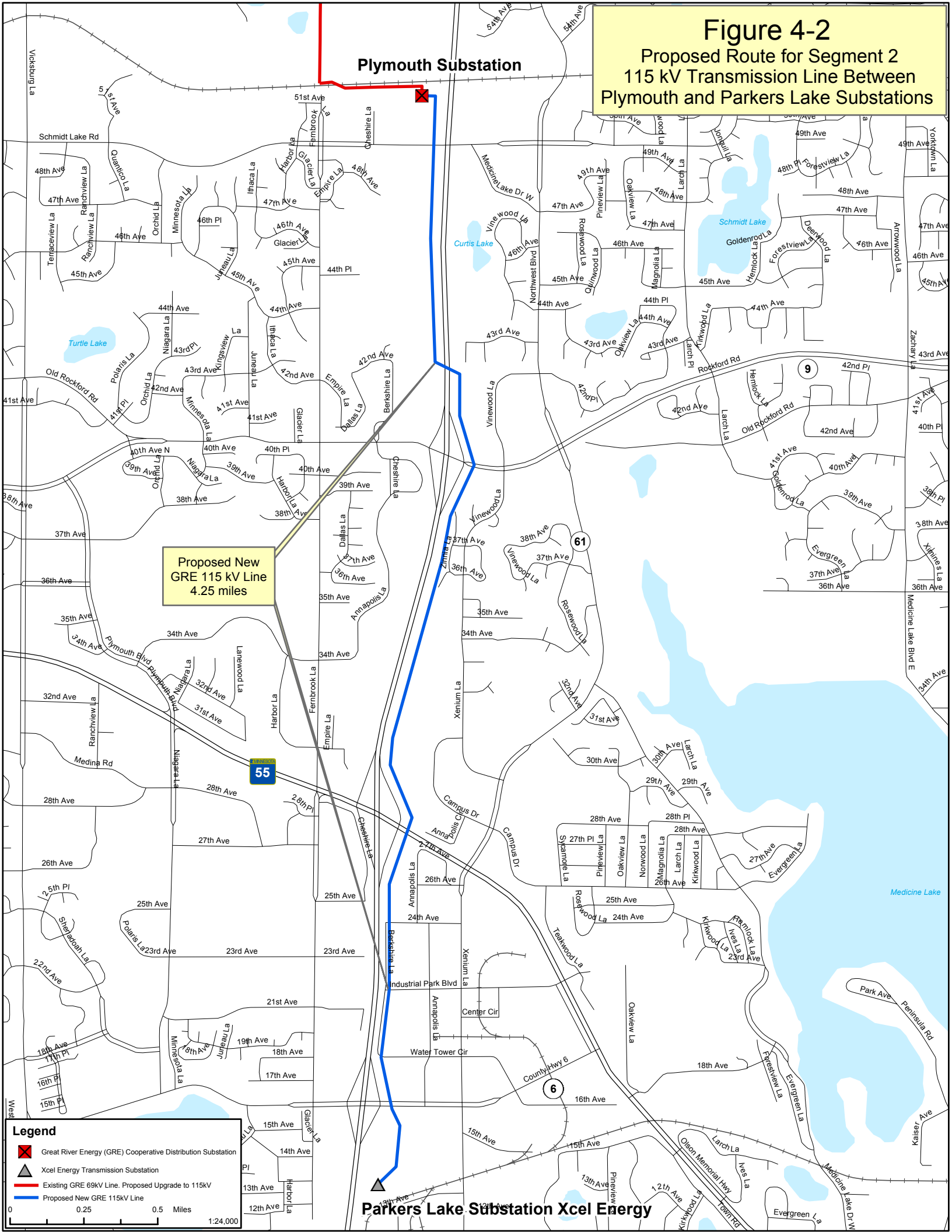


Figure 4-2
Proposed Route for Segment 2
115 kV Transmission Line Between
Plymouth and Parkers Lake Substations
Plymouth Substation
Proposed New
GRE 115 kV Line
4.25 miles
Parkers Lake Substation Xcel Energy
Legend
Great River Energy (GRE) Cooperative Distribution Substation
Xcel Energy Transmission Substation
Existing GRE 69kV Line. Proposed Upgrade to 115kV
Proposed New GRE 115kV Line
0 0.25 0.5 Miles
1:24,000
Schmidt Lake Rd
Medina Rd
Old Rockford Rd
Rockford Rd
Plymouth Blvd
Industrial Park Blvd
Center Cir
Water Tower Cir
County Hwy 6
Medicine Lake
Schmidt Lake
Curtis Lake
Turtle Lake
55
61
9
6

4.3.4 Substations Affected

GRE's proposed 115 kV line project supports five existing distribution substations and involves two existing bulk transmission substations as shown on Figure 1-2. Substation modifications will generally take place within the existing substation footprint; however, some site modifications may be required. The impact of the proposed project on each substation is as follows:

Elm Creek (Xcel Energy)

Modifications within Elm Creek Substation would be required to construct the additional 115 kV termination for the new GRE line.

Hennepin (Connexus Energy)

The existing 69 kV distribution transformers would be replaced with 115 kV distribution transformers.

Arbor Lake, Cedar Island, Bass Lake, Plymouth (W-H)

The existing 69 kV distribution transformers would be replaced with 115 kV distribution transformers.

Parkers Lake (Xcel Energy)

Modifications would be required to construct the additional 115 kV termination for the new GRE line.

5. ENVIRONMENTAL INFORMATION – PROPOSED ROUTE

Minn. Rules pt. 4400.1150, subp.3 requires environmental information for the proposed route that is intended to meet the needs of the Plymouth – Maple Grove load center. This portion of the application provides a description of the land use and environmental setting associated with the project.

The HVTL project has been reviewed by a number of state and federal agencies. All environmental review correspondence related to the proposed 115 kV transmission line route is provided in Appendix C.

Supporting documentation (description of vegetative communities) and maps showing environmental features (water resources, vegetation and land use) are provided in Appendix D.

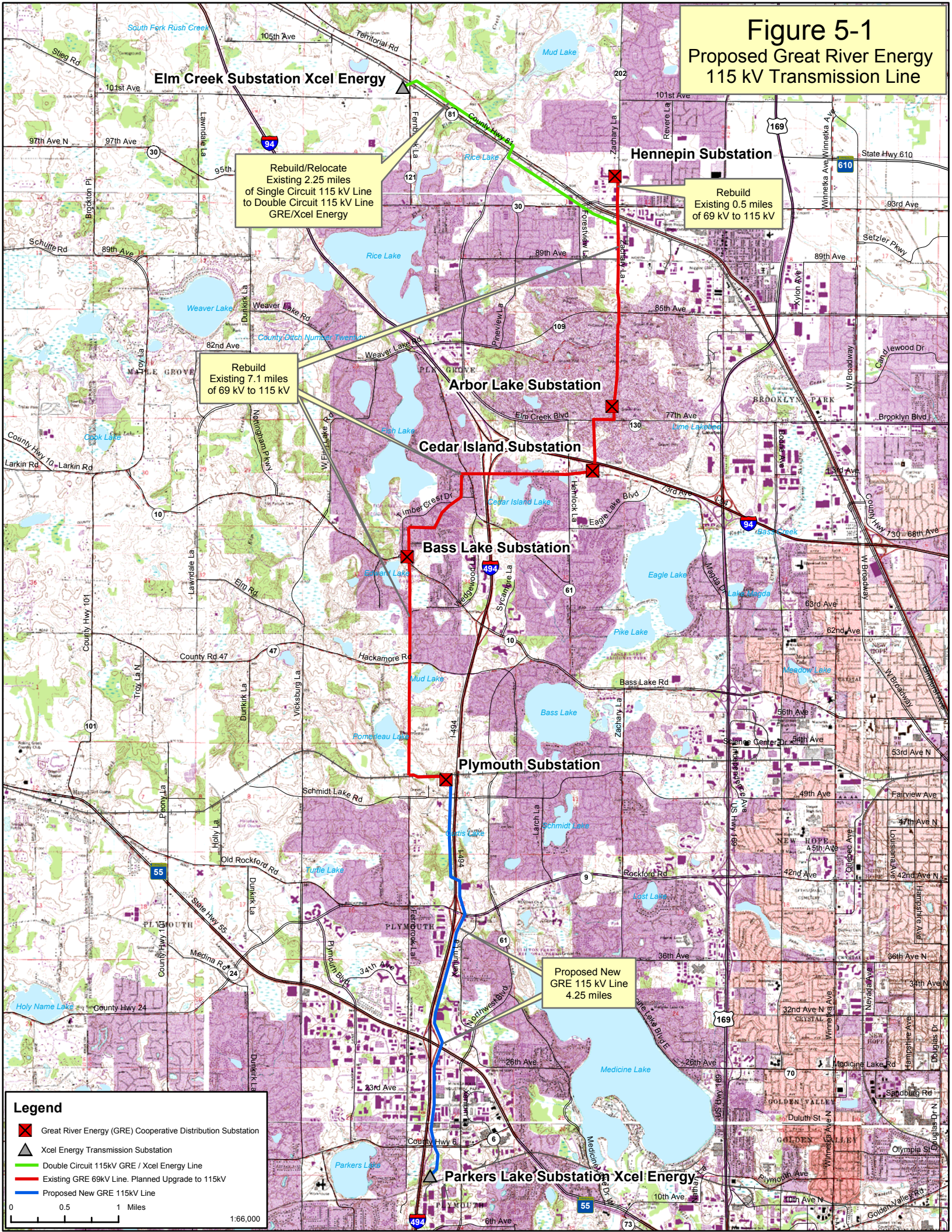
5.1 Description of Environmental Setting

The proposed route for the 115 kV transmission line extends from the Elm Creek Substation near the intersection of CR 81 and Fernbrook Lane in Maple Grove to the Parkers Lake Substation near the intersection of CR 6 and I-494 in Plymouth as identified in Figure 5-1. Fieldwork along the proposed route needed to prepare this Application was completed in May 2003.

The environmental setting along the proposed route includes hydrological features such as lakes, creeks, ditches, wetlands, and riparian areas. A mix of vegetative communities dominated by yards, ornamental and boulevard trees, and herbaceous plants are also present along the proposed route. Wildlife habitat exists although it is limited to wetlands and park property. There are no threatened or endangered species or state listed species identified along the proposed route or any sites that are classified as rare or unique. Further, the physiographic features (topography, soils, geology, and prime farmland) are typical for this area and do not preclude the use for development of an HVTL.

Land use along the proposed route includes a mix of industrial, commercial, residential, parks and open space, and agricultural lands. Industrial land uses include manufacturing, office-warehouse, office-showroom, and warehouses. Commercial uses include retail and service businesses. The residential areas along the proposed route range from single-family homes to mixed high-density dwellings. Parks and open space include community and school playfields, neighborhood and regional parks, and golf courses. Agricultural lands along the proposed route exist as undeveloped land.

Figure 5-1
Proposed Great River Energy 115 kV Transmission Line



5.2 Effects on Human Settlement

5.2.1 Public Health and Safety

The Minnesota Department of Transportation (DOT), Office of Aeronautics was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the proposed project on airports or airstrips in the project area. In a letter dated July 23, 2003 (Appendix C), the DOT indicated that the nearest public use airport (Crystal Airport) is approximately four miles from the proposed line and records do not indicate any private airstrips in the vicinity. The DOT has no objection to the proposed project, as no effects on public airports or private airstrips in the project area are anticipated.

The primary public health and safety issues with electrical transmission lines are electromagnetic fields (EMF) and ozone and nitrogen oxide emissions, which are discussed in Sections 7.2 and 7.3 of this document.

5.2.2 Displacement

The siting of the transmission line and new poles will be done in a manner such that no person will be displaced from their residence or business.

5.2.3 Noise

Audible noise is due to point source corona (minor breakdown of air insulating a conductor) and is a function of conductor voltage gradient, which is increased by irregularities on the conductor surface and hardware due to burrs on the material when new, and rain droplets on the surface. The major cause of these irregularities are rain droplets or droplets from heavy fog that form underneath the conductor. In foggy, damp, or rainy weather conditions, power lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the wires.

Audible noise is generally measured by the decibel (dB(A)) scale (the “A” suffix refers to the weighting network used for measurement), which is used for general noise ordinances.

The 115 kV line operating at or below 121 kV should not exceed approximately 12 dB(A) at the edge of the right of way during fair weather conditions. When dry, the noise level at the right of way edge will be essentially inaudible. During a heavy rain (1 inch per hour) the noise level may approach 18 dB(A) at the right of way edge. However, background noise levels will be greatly increased.

Table 5-1 lists some common noise levels.

Table 5-1 Common Noise Levels

Sound Level db(A)	Environmental Condition
134	Threshold of pain
114	Loud automobile horn
80-90	Inside motor bus
74	Average traffic on street corner
60-70	Conversational speech
54	Typical business office
40-50	Living room, suburban area
34	Library
20-30	Bedroom at night
14	Broadcast studio
0-10	Threshold of hearing

Source: Electric Power Research Institute (EPRI), 1982.
Note: Noise levels for a 115 kV transmission line would be between 0 and 18 dB(A), depending on the weather.

The Noise Control Requirement in Minnesota Pollution Control Agency (PCA) Minn. Rules 7030.0030 (Minnesota Pollution Control Agency, Undated) states that noise contributors shall comply with the Noise Area Classifications (NAC) Rule 7030.0040 criteria shown in Table 5-2.

The noise area classification is based on land use activity at the location of the receiver. For example, household units are defined under NAC (1), bus passenger terminals are defined under NAC (2), and transportation right of way is defined under NAC (3). NAC (1) includes the most noise sensitive areas such as households, hospitals, churches, and campgrounds. The L_{10} is defined as the noise level exceeded 10 percent of the time, or for six minutes in an hour. The L_{50} is the noise level exceeded 50 percent of the time, or for 30 minutes in an hour. The L_5 is the noise level exceeding 5 percent of the time, or for 3 minutes in an hour.

Table 5-2 Rule 7030.0040 Noise Area Classifications

	Day (0700-2200)		Night (2200-0700)	
NAC	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The industry standard for utilities is calculated based on L_{50} and L_5 for audible noise emissions. The worst case scenario is when the transmission line is exposed to heavy rain conditions (one inch per hour). Anticipated levels for heavy rain conditions for the proposed 115 kV line based on the results from the Bonneville Power Administration Corona and Field Effects Program version 3 (U.S. Department of Energy (USDOE), Bonneville Power Administration (BPA), Undated) are listed in Table 5-3.

Table 5-3 BPA Program Results – Heavy Rain Case

L_5	L_{50}	NAC Category
17.7 dB(A)	14.2 dB(A)	1 (edge of right of way)
18.8 dB(A)	15.3 dB(A)	3 (directly under the line)

BPA has developed a general guideline based upon public response to alternating current (AC) transmission line audible noise. The guideline indicates that numerous complaints can be expected if the line noise exceeds approximately 58.5 dB(A) and that few complaints should be expected if audible noise is limited to 52.5 dB(A). The calculated values for the proposed project are well below the guidelines mentioned above, and during fair weather audible noise will be barely perceptible.

5.2.4 Aesthetics

The new pole design for the 115 kV transmission line will have a narrower profile and be less intrusive than the existing 69 kV line poles. This will result in a more aesthetically pleasing design for the new poles compared to the existing poles.

In some instances, particularly in neighborhoods, the existing distribution line will be placed underground, improving the overall appearance of the line.

5.2.5 Socioeconomics

Demographics

The population of the City of Plymouth in 2000 was 65,894 with a 29.5 percent increase in population from 1990 through 2000 (City of Plymouth, 2000). During this ten year time period, the number of persons per square mile (density) increased by 29.6 percent and the number of housing units increased by 28.8 percent. The housing occupancy rate in 2000 included 76.5 percent owner-occupied units and 23.5 percent renter-occupied units.

The population of the City of Maple Grove in 2000 was 50,365 with a 30 percent increase in population from 1990 through 2000 (City of Maple Grove, 1999). During this time period, the number of persons per square mile (density) increased by 29.9 percent and the number of housing units increased by 36.8

percent. The housing occupancy rate in 2000 was 92.7 percent owner-occupied units and 7.3 percent renter-occupied units.

The minority population includes individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (Council on Environmental Quality, 1997).

The City of Plymouth had a 91.4 percent White population group in 2000. The primary minority group was Asian (3.8%). The 2000 population was almost evenly split between males and females (49.3% and 50.7%, respectively). The age group composition was 65.3 percent for the 18-64 age group and 27.1 percent for the under-18 age group.

The City of Maple Grove had a 94.7 percent White population group in 2000. The primary minority group was Asian (2.5%). The 2000 population was almost evenly split between males and females (49.5% and 50.5%, respectively). The age group composition was 65.1 percent for the 18-64 age group and 30.8 percent for the under-18 age group.

Economy

Business patterns for the City of Plymouth, based upon the most recent information available (US Bureau of the Census, 1997), indicated a work force of approximately 40,674 employees with a total annual payroll in excess of $1,399 million. Industries identified included: manufacturing; wholesale trade; retail trade; real estate and rental and leasing; professional, scientific and technical services; administrative, support, waste management and remediation services; educational services; health care and social assistance; arts, entertainment and recreation; accommodation and food service; and other services (except public administration).

The 1999 median household income for the City of Plymouth (City of Plymouth Citizen Survey Executive Summary, 1999) was $79,000. The U.S. Census Bureau poverty threshold for a four-person family in 1999 was $17,029.

The business patterns for the City of Maple Grove, based upon the most recent information available (US Bureau of the Census, 1997), indicated a work force of approximately 12,452 employees with a total annual payroll in excess of $399 million. Industries identified included: manufacturing; wholesale trade; retail trade; real estate and rental and leasing; professional, scientific and technical services; administrative, support, waste management and remediation services; educational services; health care and social assistance; arts, entertainment and recreation; accommodation and food service; and other services (except public administration).

The 1997 median household income for the City of Maple Grove (City of Maple Grove, 1999) was $58,650. The U.S. Census Bureau poverty threshold for a four-person family in 1997 was $16,400.

5.2.6 Cultural Values

The proposed route was reviewed pursuant to the responsibilities given the Minnesota Historical Society by the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act. It was also reviewed pursuant to the responsibilities given the State Historic Preservation Officer by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council on Historic Preservation (36 Code of Federal Regulations (CFR)800). There are no properties listed on the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this project.

5.2.7 Public Services

Public services provided by the cities of Plymouth and Maple Grove (i.e., police, fire protection, waste collection, etc.) will not be affected by the proposed transmission line. There are no anticipated impacts on the public services in these communities.

5.2.8 Unavoidable Impacts

There will be minimal short-term impacts on the human environment during the physical placement of the transmission line poles. This will be a temporary impact with no anticipated long-term impacts.

This project will utilize existing transmission line right of way for much of its distance and will provide W-H customers a reliable and efficient future energy supply. The anticipated impacts are therefore positive.

5.2.9 Potential Mitigation

There is no anticipated mitigation necessary for the effects on human settlement.

5.3 Effects on Land-Based Economies

5.3.1 Agriculture

Undeveloped land and agricultural land occur in limited areas west of the proposed route and are not affected by the proposed route. These areas consist of pastureland and agricultural land that is not in production. Development is beginning in some of these areas, as evidenced by survey staking and earthmoving operations.

Agricultural production does occur in limited areas located in Sections 33 and 34 of Township 119 North, Range 22 West; and Sections 3 and 4 of Township 118 North, Range 22 West. The agricultural sites are tilled for row crop production and are currently planted in soybean and corn. Residential development is occurring adjacent to these agricultural production areas. Most of the land that is currently in agricultural production is zoned for "Mixed Low-Medium Density Residential," "Mixed Medium Density Residential," and "Single-Family Residential."

5.3.2 Forestry

Prior to European settlement, much of the proposed route was dominated by deciduous forest. Forest types included oak forest, maple-basswood forest, lowland hardwood forest, and black ash swamps. Most of the forested areas have now been converted to residential or commercial developments. Remaining forestlands are now limited mostly to parks and public recreation areas. Silvicultural activities within the proposed route would be in accordance with resource management plans for the parks and public lands. The largest forested area along the proposed route is west of I-494 between the Plymouth and Parkers Lake substations.

5.3.3 Tourism

Tourism services provided by the cities of Plymouth and Maple Grove will not be affected by the proposed transmission line. There are no anticipated impacts on tourism in these communities.

5.3.4 Mineable Resources

There is an active gravel pit located in the City of Plymouth in the central area of the proposed route. The gravel mining operation is located in Township 118 North, Range 22 West, West ½ of Section 10. In addition, a large gravel pit is located in the northern portion of the project in the City of Maple Grove. This gravel mining area is located in Township 119 North, Range 22 West, Sections 13, 14, 22, 23, 24, 25 and 26. Potential impacts to the mining area are minimal and will be limited to the ground disturbances associated with the transmission pole placement.

The City of Maple Grove's Comprehensive Land Use Plan (City of Maple Grove, 1999) includes the development of the gravel mining area. The "Gravel Mining Area Special Area Plan" was developed by the City of Maple Grove in 1996 and outlined the long-term development of the gravel mining area (City of Maple Grove, 1996). The long-term plan called for a dense, mixed-use development combining industrial, commercial, residential, and public recreational use. The proposed 115 kV project is consistent with the plan, making use of existing transmission line right of way for most of its length and providing W-H customers

with a reliable and efficient future energy supply. Therefore, the anticipated impacts are positive for future growth in the project area.

5.3.5 Unavoidable Impacts

There do not appear to be any unavoidable impacts to the land-based economies due to the proposed 115 kV transmission project.

5.3.6 Potential Mitigation

Mitigation measures are not anticipated for the land-based economies along the proposed transmission line route.

5.4 Cultural Resources

5.4.1 Archaeological and Historic Resources

The Minnesota Historical Society (MHS) was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the proposed project on historic properties in the project area. In letters dated July 22, 2003 and September 4, 2003 (Appendix C), the MHS indicated that there are no properties listed on the National or State Registers of Historic Places, and no known or suspected archaeological properties in the area that will be affected by this project.

The proposed route was reviewed pursuant to the responsibilities given the Minnesota Historical Society by the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act. It was also reviewed pursuant to the responsibilities given the State Historic Preservation Officer by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council on Historic Preservation (36CFR800).

5.4.2 Unavoidable Impacts

The proposed route is not in the vicinity of any historic property or archaeological site. As such, there are no anticipated impacts to cultural resources sites in the project area.

5.4.3 Potential Mitigation

Historical and archaeological resources were not identified within the proposed route. Therefore, no impacts are anticipated during the installation of the transmission line poles. If any archaeological sites are identified during placement of the poles along the proposed route, the particular site will be avoided and the poles placed outside the specified buffer zone.

5.5 Air Quality

Minnesota Rules, Chapter 4400.1150; subpart 3, item E requires environmental information for a power plant site permit or a HVTL route permit.

The only potential air emissions from a transmission line result from corona, which may produce ozone and oxides of nitrogen. This can occur when the electric field intensity exceeds the breakdown strength of the air. For a 115 kV transmission line, the conductor surface gradient is typically below the air breakdown level. As such, it is unlikely that any measurable emissions would occur from the conductor surface.

Therefore, the 115 kV transmission line project is not expected to impact air quality.

5.6 Water Resources

Water resources along the proposed route include lakes, creeks, ditches, riparian areas, ground water, floodplains, and wetlands.

Riparian areas are defined as ecosystems that occur along watercourses or at the fringe of water bodies (Natural Resources Conservation Service (NRCS), April 1999). For purposes of this report, the riparian area is defined as the land within 300 feet of streams and within 1,000 feet of lakes. These distances were selected because they are consistent with the definition of shoreland in the Minnesota Department of Natural Resources (DNR) Statewide Standards. These statewide standards set guidelines for the use and development of shoreland (riparian) property around all lakes greater than 25 acres (10 acres in municipalities) and rivers with a drainage area of two square miles or greater.

The ground water aquifers in Hennepin County are part of the Minnesota Metro Ground Water Province. These aquifers yield useable quantities of water in Minnesota and surrounding states. The aquifer systems utilized for water in the project area are the Glacial Drift and the Cambrian-Ordovician. The Cambrian-Ordovician aquifer system includes the Prairie du Chien-Jordan and Mount Simon aquifer units. The City of Maple Grove provides water drawn from wells that are drilled 157 to 715 feet deep into the Glacial Drift and Mount Simon aquifers. The City of Plymouth provides water drawn from wells that are drilled 302 to 473 feet deep into the Prairie du Chien and Jordan aquifers.

The Glacial Drift aquifer system is composed of stratified sand and gravel, ice-contact deposits and alluvium of glacial origin. These surficial glacial deposits range from 50 to 400 feet in thickness. Wells draw considerable water from this aquifer system for public supply, agricultural, and industrial uses. Because this aquifer system is present at the land surface and highly permeable, it is vulnerable to contamination. This uppermost aquifer system is hydraulically connected to the underlying bedrock aquifers as water percolates down to

recharge the lower aquifers. The chemical quality of the ground water is dominated by calcium, magnesium and bicarbonate ions.

The Cambrian-Ordovician aquifer system is composed of sandstone and dolomite aquifer units separated by less permeable confining units. Low permeability crystalline rocks underlie this deep aquifer system. After the Glacial Drift aquifer, this is the second largest source of ground water for public supply, agricultural, and industrial uses in the region. This aquifer system includes the Prairie du Chien-Jordan and Mount Simon aquifer units. The Prairie du Chien aquifer consists of an upper and lower dolomite unit with an intervening sandstone unit with a maximum thickness of 500 feet. The Jordan aquifer is a sandstone unit ranging in thickness from 60 to 140 feet. The Mount Simon aquifer is also a sandstone unit ranging from 100 to 250 feet in thickness. Major cations in the Prairie du Chien-Jordan aquifer are calcium, magnesium and sodium; major anions are bicarbonate, sulfate and chloride. The ground water also contains concentrations of iron and manganese.

The cities of Plymouth and Maple Grove have adopted floodplain regulations limiting project development within the 100-year floodplain. The purpose of these floodplain regulations is to protect public safety and to decrease the chances of private property losses due to flooding. Projects that result in a loss of floodplain area are required to replace a similar acreage at another location. These floodplain replacement sites may be created in conjunction with wetland mitigation sites and therefore function as wetland replacement and floodplain replacement sites.

The DNR was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the proposed project on waters and wetlands in the project area. In a letter dated August 26, 2003 (Appendix C), the DNR indicated that they had no comments on the project.

The United States Army Corps of Engineers (Corps) was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the proposed project on floodplains, waters, and wetlands in the project area. In a letter dated September 4, 2003 (Appendix C), the Corps indicated that the work proposed is not within the regulatory jurisdiction of the Corps of Engineers. No work will be done in or above a navigable water of the United States, and no dredged or fill material will be discharged in any water of the United States, including wetlands. A Department of the Army permit is not required to do this work.

Fieldwork was completed for the proposed route in May 2003. A detailed explanation of hydrologic features in the area was provided in the Certificate of Need Application (GRE and W-H, 2002). Maps for each segment are provided in Appendix D1 (WR1-WR13).

5.6.1 Elm Creek Substation to Intersection of CR 81 and Zachary Lane

Lakes

There are no lakes present in this segment of the proposed route (see WR!-WR3).

Creeks and Ditches

The proposed route crosses two creeks in this segment, an unnamed creek north of the Elm Creek Substation and Elm Creek, which is listed as a protected waterway by the DNR (see WR1). The proposed route is located between CR 81 and the railroad embankment. Most of this area consists of a roadway ditch.

Riparian Areas

The riparian area in this segment of the proposed route is adjacent to Elm Creek. The vegetation in the riparian area consists of cattails in the low areas between CR 81 and the railroad embankment.

Floodplains

The Federal Emergency Management Agency (FEMA) identifies a 100-year floodplain within this portion of the proposed route adjacent to Elm Creek (see WR1 and WR2). The proposed route crosses the floodplain, which includes the low area between CR 81 and the railroad embankment.

Wetlands

There are no wetlands located within this segment of the proposed route; however, numerous wetlands are located adjacent to the proposed route (see WR2). One basin adjacent to the route is identified as DNR protected wetland 276W and is identified in the National Wetlands Inventory (NWI) as a Palustrine Emergent Semi-permanently Flooded basin (PEMFd) that has been partly drained.

5.6.2 Hennepin Substation to Arbor Lake Substation

Lakes

There are no lakes in this segment of the proposed route.

Creeks and Ditches

There are no creeks and ditches located in this segment of the proposed route.

Riparian Areas

Deepwater habitat and riverine resources were not identified in this segment of the proposed route; consequently, no riparian areas are present.

Floodplains

The proposed route is not located within a floodway or floodplain as designated by FEMA.

Wetlands

There is one wetland located in this segment adjacent to the proposed route (see WR4). It is classified in the field as a Palustrine Unconsolidated-bottom Semi-permanently Flooded (PUBFx) basin that has been excavated.

5.6.3 Arbor Lake Substation to Cedar Island Substation

Lakes

There are no lakes located in this segment of the proposed route.

Creeks and Ditches

There are no creeks or ditches located in this segment of the proposed route.

Riparian Areas

Deepwater habitat and riverine resources were not identified in this segment of the proposed route; consequently, no riparian areas are present.

Floodplains

The proposed route is not located within a floodway or floodplain as designated by FEMA.

Wetlands

There are two wetlands located in this segment (see WR5). A PUBFx basin that has been excavated is located on the northwest corner of the intersection of Zachary Lane and CR 130). A Palustrine Emergent Temporarily Flooded

(PEMA) wetland basin is located adjacent to the proposed route and north of I-694.

5.6.4 Cedar Island Substation to Bass Lake Substation

Lakes

There are no lakes located within this segment of the proposed route, although Fish Lake and Cedar Island lakes are located adjacent to the proposed route. They are designated as DNR Protected Waters 118P, and 119P, respectively.

Creeks and Ditches

There is an unnamed creek that crosses the proposed route near the intersection of Sunny Slope Drive and Timber Crest Drive (see WR7). This creek crosses the proposed route and flows toward a Palustrine Emergent Seasonally Flooded (drained) wetland (PEMCd) identified on the NWI map, which is also a DNR Protected Wetland (546W). The stream flow continues west towards Fish Lake, which is identified by the NWI as Lacustrine Limnetic Unconsolidated-bottom Permanently Flooded (L1UBH) and is also a DNR Protected Water (120P).

Riparian Areas

Riparian areas of Cedar Island Lake are located within this segment of the proposed route. Cedar Island Lake is located south of 73rd Avenue between I-494 and Hemlock Lane. The riparian area consists primarily of residential property with grassed yards and ornamental vegetation.

Floodplains

The proposed route is not located within a floodway or floodplain as designated by FEMA.

Wetlands

There are four wetlands located in this segment of the proposed route (see WR5-WR7). One wetland basin (PUBF), adjacent to the proposed route, is located at the southwest corner of 73rd Avenue North and Hemlock Lane North. This basin is designated as DNR Protected Wetland 555W. The second wetland is also a PUBF basin that is designated as DNR Protected Wetland 545W. This wetland is surrounded by a lowland hardwood forest and is located north of Timber Crest Drive. The other two wetlands are small Palustrine Emergent Seasonally Flooded (PEMC) basins located along 73rd Avenue and along Sunny Slope Drive. These wetlands were identified in the field.

5.6.5 Bass Lake Substation to Plymouth Substation

Lakes

Edward Lake, designated as DNR Protected Water 120P, is located adjacent to the proposed route in this segment.

Mud Lake is located in this segment of the proposed route, south of CR 47. The existing transmission line crosses the southwest corner of the lake (see WR9). The lake appears to be relatively shallow with an estimated maximum depth of less than ten feet. The lake is approximately 30 acres in size and is not managed by the DNR for fishing. The basin is listed on the DNR Protected Waters Inventory as a public water wetland, and is classified as a lacustrine waterbody on the NWI map.

Creeks and Ditches

This segment of the proposed route crosses one creek listed as a DNR Protected Waterway. It is unnamed and crosses the corridor just west of the Plymouth Substation. The waterway flows from a point west of Vicksburg Lane, crosses I-494 near the Plymouth Substation, then continues flowing west into Bass Lake. The creek has been recently altered along the proposed route west of the Plymouth Substation near Cheshire Lane. The creek also appeared to have been channelized. The existing transmission line crosses the creek north of the railroad corridor (see WR9). At this point the creek flows through a golf course and into a wooded floodplain. Private or public ditches were not found within the proposed route. Roadway and railroad ditches were present in various places within the corridor.

Riparian Areas

The riparian area of Edward Lake (located southwest of the Bass Lake Substation) consists of residential property with grassed yards and ornamental vegetation. There is a Palustrine Emergent/Broad Leafed Deciduous Scrub-shrub Seasonally Flooded (PEM/SS1C) wetland located in the northeast riparian area of the lake (NWI map).

Another riparian area within the proposed route corridor is adjacent to Mud Lake. This area contains a golf course, a woodland brushland plant community, a lowland hardwood forest, open grassland, a grass hay field, a cattail marsh wetland, a willow swamp wetland, and an oak forest plant community. The topography is relatively unaltered. The native vegetation has been removed where the native deciduous forest has been converted to a golf course and a hayfield. The oak forest on the northwest shore of Mud Lake is part of a city or

regional park. Walking trails were being constructed along the lakeshore at the time of the fieldwork.

Although the proposed route does not cross any other deepwater habitats, the corridor bisects the riparian area (within 1000 feet) of Pomerleau Lake (see WR9). Most of this area is currently under development. The only permanent vegetation was west of the existing transmission line. This area is dominated by an oak forest plant community and is located mostly adjacent to the proposed route.

Riparian areas are also present along the unnamed creek. A golf course and a railroad line are located on the west side of the transmission line the riparian area. The vegetation consists of turf grass and the topography appeared to be unaltered. On the east side of the proposed route, the riparian area consists of a floodplain forest plant community. The railroad line is the only major topographical alteration of the riparian area in this part of the proposed route.

Floodplains

The existing transmission line crosses a floodplain just west of the Plymouth Substation that FEMA identifies as a 100-year floodplain (see WR9). The topography of the floodplain area within the proposed route is relatively unaltered with the exception of the railroad line. The railroad line was built on the south edge of the floodplain. Historically, the creek crossed the railroad near the Cheshire Lane overpass. This area has been altered recently; however, floodwaters can travel south of the railroad through the culverts. No dikes or levees are present and the floodplain can receive floodwaters during peak runoff events. The creek appears to have been channelized through the golf course, increasing the slope from the historic stream morphology.

Wetlands

There are seven wetlands located in this segment of the proposed route (see WR8 and WR9). Four of the wetlands are PEMC basins. The other three wetlands include two Palustrine Scrub-shrub Broad-leaved Deciduous Emergent Seasonally Flooded (PSS1/EMC) basins and a Palustrine Forested Broad-leaved Deciduous Intermittently Flooded flat (PFO1J). Mud Lake is listed on the DNR Protected Waters Inventory as a public water wetland and on the NWI as a lake. The PEMC wetlands are located between Mud Lake and the area north of CR 47. The PEMC wetland located north of 63rd Avenue is a large partially drained cattail marsh listed as DNR Public Water wetland 535W. The existing transmission line corridor includes only a small area of the basin on the western side. The PSS1/EMC wetlands are located west of the Plymouth Substation and west of Mud Lake. The PFO1J wetland is located southeast of Pomerleau Lake.

Many of the PEMC wetlands have been partially drained through surface ditches or subsurface drain tiles. In addition, some of the PEMC wetlands have been partially cut for hay and some have been partially tilled. The PFO1J wetland is relatively undisturbed east of the existing transmission line, while it has been converted into a golf course west of the line. The PSS1/EMC wetland is part of the floodplain isolated by the railroad. The PFO1J wetland area is included on the NWI as part of a larger PEMC wetland. The PSS1/EMC wetland appears to be mostly undisturbed. It is the south part of a larger basin that was bisected by the construction of CR 47. The north half is partially drained and is connected by culverts under CR 47.

5.6.6 Plymouth Substation to Parkers Lake Substation

Lakes

There are no lakes located in this segment of the proposed route (see WR 10-WR13).

Creeks and Ditches

There are two creeks located in this segment of the proposed route (see WR11 and WR12). Plymouth Creek crosses the proposed route and flows east to Medicine Lake. A small tributary flowage of Plymouth Creek crosses the proposed route. It also flows east, meandering through a large wetland complex joining Plymouth Creek near Xenium Lane. At the time of the survey, some roadway ditches contained surface water where they are adjacent to wetlands. No legal drainage systems were identified in this segment of the proposed route.

Riparian Areas

Some areas of the proposed route are within 1000 feet of Curtis Lake (see WR10). The area is located along I-494 south of Schmidt Lake Road. The vegetation in this area consists primarily of open grassland, lowland hardwood forest, and cattail marsh. Curtis Lake is a small lake and is not managed by the DNR as a fishery. Another riparian area is located on either side of Plymouth Creek. Vegetation in this area is mostly cattail marsh and maple-basswood forest.

Floodplains

FEMA identifies a 100-year floodplain in two areas of this segment of the proposed route (see WR12). One is adjacent to Plymouth Creek and the other is adjacent to a tributary flowage of Plymouth Creek. The floodplain area of the tributary flowage is located just east of the proposed route. The proposed route crosses both Plymouth Creek and the tributary flowage of Plymouth Creek.

Wetlands

There are 10 wetlands located in this segment of the proposed route (see WR10-WR13). Seven of the wetlands are PEMC basins. Two wetlands are PEMF basins and one is a PUBGx (Palustrine Unconsolidated Bottom Intermittently Exposed). The PEMF basins are larger than the PEMC basins, with one basin over 40 acres in size. The largest wetland is listed as DNR Public Water Wetland 594W. Most of the wetlands have inlets and outlets and receive storm water runoff from residential and commercial developments via roadway ditches and runoff culverts.

5.6.7 Unavoidable Impacts

Potential impacts to the hydrologic features identified along the proposed route would be limited to ground disturbances due to pole placement in the riparian, floodplain, and wetland areas. Impacts to these areas will be temporary and limited to the specific pole location and the area directly adjacent to the pole. Due to the relatively small areas that would be disturbed and the flexibility to avoid placing poles in sensitive areas, the anticipated impacts to the hydrologic features along the proposed route are minimal.

The wood poles used for this project will be pretreated with pentachlorophenol or creosote to increase the wood durability and life expectancy of the poles. Degradation of these wood preservatives occurs through aerobic soil degradation, aerobic and anaerobic aquatic degradation, and photolysis. However, the respective half-life for these processes range from less than 20 minutes to 63 days, the preservatives are not very mobile in soil or water, and are subject to biodegradation to its elemental state near the pole. Therefore, there will be no long-term impacts from the use of these preservatives.

5.6.8 Potential Mitigation

Unavoidable impacts to wetland resources and other hydrologic features will be identified and the necessary permits or licenses will be requested. Unavoidable impacts will be mitigated as required by local, state, and federal regulatory permits.

5.7 Natural Vegetation and Associated Wildlife

The DNR was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the proposed project on threatened and endangered species in the project area. In a letter dated August 26, 2003 (Appendix C), the DNR indicated that they had no comments on the project.

The United States Fish and Wildlife Service (FWS) was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the

proposed project on threatened and endangered species or critical habitat in the project area. The FWS did not respond to GRE's environmental review request.

There are 19 types of vegetative communities identified within the proposed route. Species typical of each vegetative community are described below and in Appendix D2. The route segment summaries below describe the location of the vegetative communities. Maps for each segment are provided in Appendix D3 (VC1-VC13).

5.7.1 Elm Creek Substation to Intersection of CR 81 and Zachary Lane

Vegetative Communities

Three vegetative communities are identified in this segment of the proposed route (see VC1-VC3). The dominant vegetative community in the area between the Elm Creek Substation and CR 30 is creeks and ditches (CD). This includes roadway and railroad ditches, creeks, and flowages. The vegetative community between CR 30 and Zachary Lane North is primarily yards, ornamental and boulevard (YOB). This includes residential and commercial or industrial yards, grassed road slopes, and approaches. Another vegetative community encountered along this segment is roadway woodland-brushland (RWB).

Wildlife Habitat

The proposed route west of CR 30 is limited to the area between CR 81 and the railroad embankment. There are shrubs and tall grass areas within the area that provide habitat, which is connected to wetland basins, Hennepin County Park property, the Elm Creek Park Reserve, and remnant wooded areas. However, access to and from the proposed route habitat is limited because of the railroad embankment and CR 81. The proposed route between CR 30 and Zachary Lane North is commercial property with grassed yards, an area between the railroad tracks, and a bike path. There is limited habitat in this area because of the lack of cover.

5.7.2 Hennepin Substation to Arbor Lake Substation

Vegetative Communities

Six vegetative communities are identified in this segment of the proposed route (see VC3-VC5). The dominant vegetative communities are gravel pits and temporary cover (GPT) and YOB. The GPT includes volunteer and remnant species from sites disturbed during gravel mining activities. The YOB includes residential and commercial or industrial yards, grassed road slopes, and approaches. There are two patches of woodland-brushland (WB) in the area, and there is an OW vegetative community adjacent to the proposed route at the

north end of the gravel mining area. Other vegetative communities along this segment include CD and developing areas (D).

Wildlife Habitat

The area between the Hennepin Substation and CR 109 is commercial and industrial property with grassed yards. Habitat is primarily small, scattered patches of WB. The area between CR 109 and the Arbor Lake Substation is an active gravel pit with limited patches of habitat. Habitat is limited to the small patches of shrubs, trees, and tall grass areas scattered throughout the segment.

5.7.3 Arbor Lake Substation to Cedar Island Substation

Vegetative Communities

Four vegetative communities are identified in this segment of the proposed route (see VC5). The dominant vegetative community is GPT that includes volunteer and remnant species from sites disturbed during gravel mining activities. Other vegetative communities include mixed emergent marsh (MEM), OW, and YOB. These communities are patchy and scattered throughout the segment.

Wildlife Habitat

This segment is an active gravel pit with limited patches of habitat. Habitat is limited to the small patches of shrubs, trees, and tall grass areas scattered throughout the segment.

5.7.4 Cedar Island Substation to Bass Lake Substation

Vegetative Communities

Seven vegetative communities are identified in this segment of the proposed route (see VC5-VC7). The dominant vegetative community is YOB that includes residential and commercial or industrial yards, grassed road slopes, and approaches. Another common vegetation community, lowland hardwood forest (LHF), is present throughout the proposed route. Other vegetative communities commonly encountered included CD, OW, WB, CM, and upland mixed forest (UMF) that are scattered throughout the segment.

Wildlife Habitat

This segment is residential with some commercial property, with habitat limited to the wetlands and park property. The remainder of the segment is primarily residential yards with patchy habitat.

5.7.5 Bass Lake Substation to Plymouth Substation

Vegetative Communities

There are 16 vegetative community types present in this segment of the proposed route (see VC8-VC9). The dominant vegetative community is YOB. YOB includes residential, commercial or industrial yards, road slopes, and approaches. These areas are scattered throughout the corridor. D is another common vegetative community category. These areas contained little or no vegetation because they were being converted into residential development. LHF and oak forest (OF) communities were also frequently encountered. Oak forest is scattered in throughout the area with the largest areas north of CR 47.

The proposed route also crosses agricultural lands in this segment. Tilled agricultural lands (AT) are present north of CR 47 and forage production (AF) is present south of CR 47 just southwest of Mud Lake. A large willow swamp (WS), another vegetative community present here but not in other segments of the proposed route, is located just south of CR 47. Other vegetative community types encountered include WB, RWB, UMF, CM, OW, CD, MEM, open grassland (OG), and floodplain forest (FF).

Wildlife Habitat

This segment consists of residential, commercial parks including golf courses, and agricultural property. The agricultural property is currently being converted into residential and commercial property. The remainder of the segment is primarily residential yards with patchy habitat. Wildlife habitat is limited to the wetlands and park property.

5.7.6 Plymouth Substation to Parkers Lake Substation

Vegetative Communities

There are nine vegetative community types in this segment of the proposed route (see VC10-VC13). The most frequently encountered vegetative community is YOB; however, significant areas of cattail marshes (CM), upland deciduous maple basswood forest (MBF), and LHF are also present. The cattail marshes are scattered throughout the corridor. The MBF community is listed on the Minnesota County Biological Survey as a remnant natural community. The OG vegetative communities were also encountered adjacent to the existing transmission line south of Schmidt Lake Road. The RWB is present primarily in the north end of the area adjacent to the Plymouth Substation. Other vegetative communities along this segment include CD, MEM, and OF.

Wildlife Habitat

Wildlife habitat is present in this segment of the proposed route; however, the corridor is immediately adjacent to I-494, and the highway and its noise restrict wildlife movement and habitat suitability for many species. The areas that provide the best opportunities for wildlife habitat include the large wetlands and mature stands of maple basswood forest located south of Schmidt Lake Road, and the wetlands and lowland hardwood forest stand adjacent to Plymouth Creek. The area south of Schmidt Lake Road is large and provides access to travel corridors to the west. The area adjacent to Plymouth Creek is somewhat limited because it is relatively small and completely surrounded by development. These areas may provide cover for many species of wildlife adapted to living in an urban environment.

5.7.7 Unavoidable Impacts

Potential impacts to the natural vegetation and associated wildlife in the proposed route will be limited to ground disturbances associated with transmission pole placement. Most of the area within the proposed route has been converted to urban development, and in addition, a significant portion of the proposed transmission line will follow existing transmission corridors. Therefore, anticipated impacts to the natural vegetation and associated wildlife along the proposed route are minimal.

5.7.8 Potential Mitigation

Impacts are expected to be minimal; therefore mitigation measures are not anticipated.

5.8 Rare and Unique Natural Resources

The DNR was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the proposed project on rare and unique features in the project area. In a letter dated August 26, 2003 (Appendix C), the DNR indicated that other than the Maple-Basswood remnant natural community previously acknowledged in correspondence during the Certificate of Need proceedings, they had no comments on the project.

Rare and unique natural features include information on federal and state protected and rare species, remnant areas of native vegetation, significant natural resource sites and significant natural features.

5.8.1 Rare and Unique Features

There are no significant natural resource sites or significant natural features identified by the DNR or the cities of Maple Grove and Plymouth along the proposed route.

The Minnesota County Biological Survey (Minnesota County Biological Survey Map Series, 1998) lists one area as a remnant natural community in the Plymouth to Parkers Lake segment of the proposed route. The area, identified as a maple-basswood forest, is located south of Schmidt Lake Road. The DNR Biological Survey description of the maple-basswood forest community is provided below.

> **Maple-Basswood Forest –** Mesic to wet-mesic forests on moist soils formed in glacial till or on cool, north-facing slopes of outwash terraces. Dense canopy dominated by sugar maple, basswood, and red oak, with lesser amounts of slippery elm *(Ulmus rubra)*, green ash *(Fraxinus pennsylvanica)*, and black ash *(Fraxinus nigra)*. American elm *(Ulmus Americana)* was once common in the canopy but is present today mostly as standing dead snags. Subcanopy and shrub layers are usually dominated by sugar maple and often contain ironwood, bitternut hickory, bladder-nut *(Staphylea trifolia),* pagoda dogwood *(Cornus alternifolia)*, red-berried elder *(Sambucus pubens),* or gooseberries. Ground layer includes early spring ephemeral species such as Dutchman's breeches *(Dicentra cucullaria)*, false rue-anemone (Isopyrum biternatum), toothwort *(Dentaria liciniata)*, and white trout-lily *(Erythronium albidum)* ; other common herbs are plants adapted to deep shade such as white bear sedge *(Carex albursina),* putty-root *(Aplectrum hyemale)*, Virginia waterleaf *(Hydrophyllum virginianum),* wild leek *(Allium tricoccum),* and zig-zag goldenrod *(Solidago flexicaulis),* as well as several species present in mesic oak forests.

5.8.2 Threatened and Endangered Species

There were no threatened or endangered species or state listed species identified by the DNR along the proposed route.

5.8.3 Unavoidable Impacts

Potential impacts to rare and unique natural resources in the proposed route will be primarily limited to ground disturbances of the maple-basswood forest located south of Schmidt Lake Road. The impacts will be associated with transmission pole placement. This portion of the proposed transmission line will follow an existing transmission corridor. Therefore, anticipated impacts to the natural

vegetation and associated wildlife will be limited to tree removal on the west side of the proposed transmission line.

5.8.4 Potential Mitigation

Native vegetation will be maintained within the proposed route that is compatible with the operation and maintenance of the transmission line. If necessary, native species will be planted or seeded in areas that are devoid of native species.

5.9 Physiographic Features

5.9.1 Topography

The topography of Hennepin County is the result of glacial deposition. The area is characterized by nearly level to steep topography. The elevation ranges from approximately 860 to 1040 feet mean sea level. The area is generally characterized by gentle to moderate topography. There are small areas located in the central portion of Plymouth that have slopes steeper than 12 percent.

5.9.2 Geology

The majority of the corridor soils were formed on the Grantsburg sublobe of the Late Wisconsinian glaciation period. The most recent glaciation period began approximately 70,000 years ago and ended 10,000 years ago. The Grantsburg Loamy Till Plain varies in thickness but is generally over forty feet in thickness. The northeast area of the proposed route consists of fluvial sediment, or outwash, deposited by water running out of a glacier.

5.9.3 Soils

Soils were formed primarily in glacial till except for the northeast area of the corridor where soils formed in outwash sediments. The dominant soil series are the Lester, Angus, Koronis and Kingsley series, which are deep, well drained soils (Lueth, 1974). Lester and Angus formed in calcareous loamy glacial till while Koronis and Kingsley formed in loamy glacial till on glacial moraines. These soils are generally fine to medium-textured and include loam and clay loam.

A portion of the proposed route, north of I-694 to 85th Avenue, is an active gravel pit. The dominant soil complex is Gravel-Udipsament, which are deep, well drained soils. These soils formed in outwash sediments and are coarse textured, including sand and gravel.

5.9.4 Prime Farmland and Additional Lands of Statewide Importance

Prime farmlands are listed by soil mapping unit for Hennepin County. Some soils have limitations such as high water table or flooding, and may qualify as prime farmland if these limitations are overcome by management methods. Some soil associations are mapped as a complex of two or three soil types and only part of the complex may be listed as prime farmland. Acreage of prime farmland was estimated using the NRCS Soil Survey of Hennepin County (Lueth, 1974).

Urban or built-up areas of soils are not considered prime farmland by the NRCS. There are approximately 1.6 acres of prime farmland found between the Plymouth and Bass Lake substations. The remainder of the proposed route consists of urban or built-up land.

The NRCS was contacted (GRE letter of June 24, 2003, Appendix C) requesting information on the possible effects of the proposed project on important or prime farmlands in the project area. In a letter dated August 20, 2003 (Appendix C), the NRCS indicated that prime farmland in the area of the project that is currently cropped will not be directly affected. Prime farmland that is currently not cropped may be affected by the project, but it appears that this would only occur in developed areas that are not feasible to farm.

5.9.5 Unavoidable Impacts

Potential impacts of construction are compacting the soil and exposing the soils to wind and water erosion. The impacts to the physiographic features should be minimal during and after installation of the transmission line structures and these impacts will be short term. There should be no long-term impacts resulting from this transmission line project.

5.9.6 Potential Mitigation

Soils will need to be revegetated as soon as possible to minimize erosion or some other method used during construction to prevent soil erosion.

5.10 Land Use

5.10.1 Municipal Land Use Categories

Land use along the proposed route consists of roadways and streets, residential, commercial, industrial, railroad and utility property, public and institutional property, parks and open space, agricultural lands, and lakes. Maps showing land use along the proposed route are provided in Appendix D4, LU1-LU13.

The most common land use categories[1] within the proposed route are Roads/Streets and Parks/Open Space. Other significant categories include Vacant/Agricultural, Residential, Gravel Mining, Industrial and Commercial properties.

Land use categories for the proposed route are given below in Table 5-4.

Table 5-4 Land Use Categories

Land Use Category	Acres in Proposed Route
Roads/Streets	51.4
Park/Open Space	27.2
Vacant/Agricultural	11.5
Residential	10.4
Gravel Mining Area	8.1
Industrial	7.7
Commercial	5.7
Railroad/Utility	2.9
Mixed Use	1.6
Public/Institutional	1.1

5.10.2 Zoning

A conditional use permit is typically required for transmission lines in excess of 33 kV from the City of Maple Grove in accordance with Section 379:39, Subdivision 3, Essential Services.

In the City of Plymouth, construction of an electric transmission line is covered in Section 21160 of the Plymouth Zoning Ordinance, Chapter 21 of the City Code 21, which requires a permit prior to the installation of the essential service.

However, GRE and W-H are seeking a route permit for this HVTL from the Minnesota Environmental Quality Board. Minn. Stat. § 116C. 61 Subdivision 1 states that "the issuance of a route permit and use of such route locations for high voltage transmission line purposes shall be the sole route approval required to be obtained by the utility. Such permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose government".

[1] Land use categories are interpretations of land use maps provided by the cities of Maple Grove and Plymouth.

5.10.3 Public Lands and Recreational Areas

Regional Parks

There are portions of four regional parks located at or adjacent to the proposed route that are managed by the Suburban Hennepin Regional Park District (Hennepin Parks). The parks include Eagle Lake Regional Park, Fish Lake Regional Park, Clifton E. French Regional Park, and Elm Creek Park Reserve. These recreational and natural areas are managed for public use with an environmental focus. Hennepin Parks has a policy that no more than 20 percent of a park reserve may be developed for active use and at least 80 percent of a park reserve is to be restored to and retained in a natural state.

Hennepin Parks offers public opportunities for nature education and recreation at these facilities. Educational opportunities include programs about maple syruping, ospreys, beaver lodges, nature centers and interpretive trails. Recreational facilities include boat launching, fishing piers, campsites, picnic areas, swimming ponds, archery ranges, sledding hills, and visitor centers. Different types of trails are also maintained within the parks, including biking and hiking trails, pet trails, cross-country ski trails, horse trails, snowmobile trails, and snowshoe trails.

Other Park and Recreational Areas

Numerous city parks, neighborhood parks, playgrounds, and school playfields are present along the proposed route. Sixteen are listed on the City of Maple Grove's website (http://www.ci.maple-grove.mn.us) and fourteen are listed in the City of Plymouth's Comprehensive Plan (City of Plymouth, 2000). Municipal trails such as city sidewalks connect these recreational sites, allowing for walking and bicycle access between most of the sites.

Regional Trails

Recreational trails along the proposed route are primarily within the regional parks. These trails are managed and maintained by Hennepin Parks. A new regional trail is currently being proposed to connect Fish Lake Regional Park and Clifton E. French Regional Park. This new trail would cross the proposed route from southeast to northwest; however, the specific alignment and width of the new trail has not been determined. The new trail would be a paved multi-use facility with vegetated buffers established on either side of the facility. A regional trail currently connects Fish Lake Regional Park and Elm Creek Park Reserve.

Municipal Trails

The City of Maple Grove has completed over 50 percent of a planned citywide loop of their Park Trail System. Maple Grove has developed over 32 miles of trails and continues to make steady progress on the development of the planned trails. Several miles of trails are constructed annually that connect neighborhoods to the city parks, natural areas, and commercial areas.

The City of Plymouth has developed over 40 miles of trails that connect Plymouth's neighborhoods to parks, open space, schools, and commercial areas. The trails are used for walking, jogging, or bicycling. In addition, the trail system supplements Plymouth's transportation system by promoting non-motorized transportation from the neighborhoods to the parks and natural areas. The City Trail and Sidewalk Plan provides for the continued development of trails and sidewalks, which will meet the future transportation and recreational needs of the community.

5.10.4 Unavoidable Impacts

Potential land use impacts along the proposed route due to the 115 kV transmission line will be very limited. The proposed route for the 115 kV transmission line will be approximately 14 miles long and will utilize existing transmission line right of way as much as possible. Of the 14 miles, approximately 4.25 miles of new right of way will be required. The new 115 kV transmission line does not represent an incompatible land use with those that exist in the corridor. Therefore, anticipated impacts of the proposed transmission line along the proposed route are minimal.

5.10.5 Potential Mitigation

Mitigation measures are not expected, as land use impacts will be minimal.

6. IDENTIFICATION OF EXISTING RIGHTS OF WAY ALONG THE PROPOSED ROUTE

6.1 Utility Rights of Way

6.1.1 Segment 1 – Elm Creek Substation to Plymouth Substation

The first portion of this segment, from the Elm Creek Substation to the intersection with GRE's existing 69 kV line connecting the Arbor Lake and Hennepin substations ("tap point"), follows an existing Xcel Energy 115 kV transmission line. The Xcel Energy line will be rebuilt on double circuit structures and the GRE line will be incorporated as the second circuit. Most of this route occupies public right of way and railroad right of way, but there are portions of the existing Xcel Energy line that occupy private right of way owned by Xcel Energy. The adequacy of the existing Xcel Energy easements will be determined after final design of the combined lines; expansion of the existing easements may be required. Total easement requirements will be determined after the final location of the line is determined in conjunction with the reconstruction of TH 610. GRE is not aware of any other private easement corridors in the area.

From the intersection of the Xcel Energy line and the existing GRE 69 kV line, GRE's proposed route follows the route of the existing 69 kV line, which would be removed and replaced by the new line. The route proceeds from the tap point north to the Hennepin Substation and south to the Arbor Lake, Cedar Island, Bass Lake, and Plymouth substations. Virtually all of this route, except for road and railroad crossings, utilizes an existing easement corridor owned by GRE. The existing easements are of sufficient width and are otherwise fully adequate for use for the proposed line. GRE will, however, independently review each existing easement to determine if there are particular limitations that would necessitate obtaining additional rights from affected owners. If any such limitations are found, owners will be contacted for the acquisition of the necessary additional rights. The presence of the existing transmission line corridor for construction of the proposed line was a major factor in the designation of this route as the proposed route. The route can be used without creating any additional easement impact on the properties traversed by the proposed line.

For the segment between the tap point and the Plymouth Substation, GRE is not aware of any other existing utility easement corridors except for the corridor occupied by Xcel Energy's double circuit 345 kV line that runs from the Parkers Lake Substation to the Elm Creek Substation. GRE is aware that Xcel Energy's easement rights include additional right of way adjacent to and westerly of the 345 kV lines in the area from the Plymouth Substation to a point approximately 1.25 miles northerly of the substation (essentially the north line of Section 3, Township 118 north, Range 22 west). Utilization of these rights was rejected by GRE for several reasons:

- There are existing major encroachments in portions of the area.
- Proceeding northerly from the termination of the existing Xcel Energy right of way would require acquisition of new easements to access the Bass Lake Substation and, unless the existing GRE corridor were used, the Cedar Island and Arbor Lake substations.
- The cost of building the 115 kV line adjacent to Xcel Energy's 345 kV line would be significantly greater than the cost for utilizing the existing GRE corridor due to difficulties in dealing with encroachments and potential interference with Xcel Energy's 345 kV line.

6.1.2 Segment 2 – Plymouth Substation to Parkers Lake Substation

This segment of GRE's proposed transmission line is entirely new and GRE has no existing easement rights in the vicinity upon which it could rely. The only other existing utility easement corridor GRE is aware of is the corridor presently occupied by Xcel Energy's 345 kV double circuit line running from the Elm Creek Substation to the Parkers Lake Substation. Xcel Energy's easement rights in the area between the Plymouth Substation and the Parkers Lake Substation include additional easement width adjacent to and westerly of the existing 345 kV lines. In determining the route for this segment of GRE's line, GRE examined Xcel Energy's easement rights closely and extensively, including performing engineering studies on the feasibility of utilizing this corridor from a construction standpoint. These studies resulted in GRE's decision to utilize Xcel Energy's additional easement rights from the Plymouth Substation south to the proposed crossing of I-494 approximately ¼ mile north of Rockford Road. Using the remainder of the Xcel Energy corridor was rejected for the following reasons:

- No easement rights exist in some areas.
- Buildings have encroached into the area of the additional right of way, both with and without the consent of Xcel Energy. Construction of GRE's proposed line would be impossible without either removing buildings or constructing lines directly above buildings.
- Xcel Energy's additional easement width is inadequate for the safe construction and operation of GRE's line in many areas; additional easement rights for wider right of way would need to be acquired adjacent to and westerly of Xcel Energy's easements.
- Engineering considerations (e.g., safety, construction difficulty, cost, etc.) diminish the desirability of this route.

It should be noted that for the portion of the proposed route utilizing Xcel Energy's easements (between the Plymouth Substation and the crossing north of Rockford Road), Xcel Energy's easement width is adequate, the easement is continuous, and there are few encroachments.

From the point of crossing I-494 northerly of Rockford Road, the proposed route generally follows the easterly right of way line of I-494 in a southerly direction. There are no existing easement rights in this area and it will be necessary for GRE to acquire new easement rights for those portions of the route not occupied by roads, railroads, and other public entities. GRE believes that the placement of the line, with structures being located as close as possible to the I-494 right of way line, will minimize the impact to the private parcels across which new easement rights must be obtained. These same placement considerations will be used for the portion of the proposed route following CR 6 and crossing into the Parkers Lake Substation.

6.2 Public Rights of Way

6.2.1 Segment 1 – Elm Creek Substation to Plymouth Station

The first segment of the line, from the Elm Creek Substation to the tap to GRE's existing 69 kV line, utilizes Xcel Energy's existing route. That route is located almost entirely on the public right of way of CR 81 and the adjoining right of way of the Burlington Northern Sante Fe Railroad. A portion of this line will need to be realigned to accommodate the construction of TH 610, but the final routing for TH 610 is not yet determined. Presumably, the realigned Xcel Energy/GRE line would also continue to maximize the joint use of highway and railroad right of way.

For the section from the tap point north to the Hennepin Substation and south to the Arbor Lake and Cedar Island substations, the existing GRE line utilizes existing private easement rights. With the exception of Zachary Lane and 77th Avenue, there is little public right of way and/or railroad right of way available in this segment of the route.

Between the Cedar Island and the Bass Lake substations, portions of the proposed route parallel 73rd Avenue North, Sunny Slope Drive, and Timber Crest Drive near the Bass Lake Substation. Structures will be located on existing private easement rights adjacent to the road right of way with the road right of way utilized for overhang purposes. Other portions of this segment traverse cross-country on existing easement rights and GRE is not aware of alternate public right of way corridors that would be superior to the proposed route.

For the segment between the Bass Lake Substation and the Plymouth Substation, the existing line and proposed route runs cross-country on existing private easements until its intersection with the existing Soo Line Railroad corridor. The Soo Line is then followed into the Plymouth Substation. A combination of the Soo Line right of way and private right of way is utilized for this segment, with existing private easement rights used for the remainder of the route to the Bass Lake Substation. There are no feasible public right of way corridors that could otherwise be used.

6.2.2 Segment 2 – Plymouth Substation to Parkers Lake Substation

GRE has no existing easement rights for this segment and so investigated several alternate routes, all of which utilized existing public highway or road right of way. Potential alignments contemplated structure placement adjacent to road right of way so as to utilize the road right of way for overhang on one side of the line.

The majority of the proposed route (from the crossing of I-494 to the Parkers Lake Substation) will utilize the right of way of I-494 and CR 6. Structures are proposed to be placed just outside of the right of way, therefore utilizing the existing road right of way for approximately one half of the necessary overhang area.

7. ENGINEERING AND OPERATIONAL DESIGN OF THE PROPOSED HVTL

7.1 Engineering and Operational Design

7.1.1 Structures

Wood single shaft poles are planned for the majority of the project. Where longer spans are required, galvanized steel single shaft poles will be utilized. Where guying (the use of anchors and support cables) is not practicable, large self-supporting steel poles will be used with drilled pier foundations.

7.1.2 Pole Top Assemblies

Horizontal post insulators are planned unless design requires longer spans beyond the capability of the insulators. The longer spans will utilize a braced post design to accommodate the increased loadings.

7.1.3 Conductors

The line design consists of three single conductor phase wires and one shield wire. The phase wires will be 795 MCM (795,000 circular mil) aluminum conductor steel supported (ACSS) with seven steel core strands and 26 outer aluminum strands. The industry code word for this conductor is “Drake.” The conductor has an overall diameter of 1.108 inches and weighs 1.094 pounds per lineal foot.

7.1.4 Line Design

Distance between structures will be approximately 400 feet. Structure heights and spans will vary depending upon topography and environmental constraints, such as highway crossings, stream crossings, and required angle structures.

7.1.5 Clearances

GRE designs transmission lines to meet or exceed two national standards. The National Electrical Safety Code (NESC) (Institute of Electrical and Electronics Engineers, 2001) recommends minimum safety standards for clearances over roadways, buildings, signs, light standards, and other facilities. The Rural Utilities Service (RUS) Design Manual for High Voltage Transmission Lines (US Department of Agriculture, 1992) recommends clearances above the minimum NESC values to account for construction tolerances, such as a pole that is set deeper than originally specified. Clearances over highways and roadways will exceed the 23

feet recommended by the RUS and may be limited by the DOT or local county highway permitting. Although RUS gives recommended clearances over buildings, it is generally recommended that transmission lines not pass directly over a building if it can be at all avoided. Clearances over swimming pools are given for reference; however, RUS recommends that transmission lines not pass over or within 25 feet of the edge of a swimming pool if at all possible. Horizontal clearances to buildings, signs, light standards, and other installations will be determined by calculating the blowout of the wire, structure deflection, and safe electrical clearance from the line.

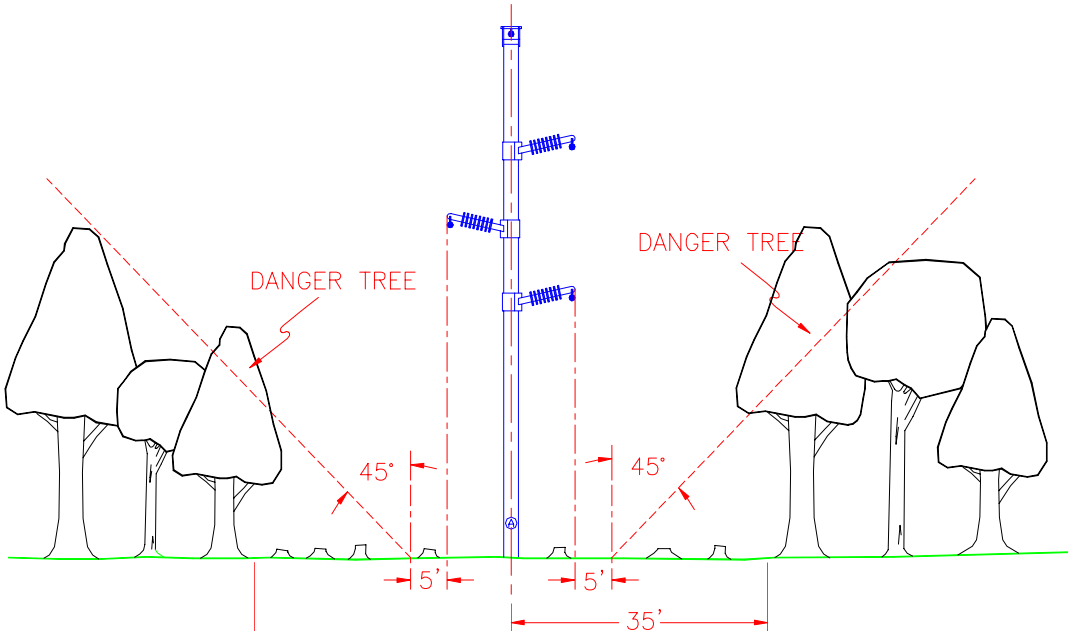
7.1.6 Right of Way Requirements

The existing 70-foot right of way width will be adequate for spans less than 600 feet. Additional right of way may be required for longer spans. Width depends on conductor blowout and the recommended RUS clearances to obstructions along the route.

7.1.7 Tree Clearing

The NESC states that “trees that may interfere with ungrounded supply conductors should be trimmed or removed.” Standard practices per specifications from the RUS indicate total removal of trees within the easement area, with additional trees and danger trees removed or trimmed beyond the easement area if they could fall into the energized transmission line as shown in Figure 7-1. Special tree trimming agreements are possible to minimize excessive tree removal based on negotiations with individual landowners.

Figure 7-1 Standard Tree Removal Practices

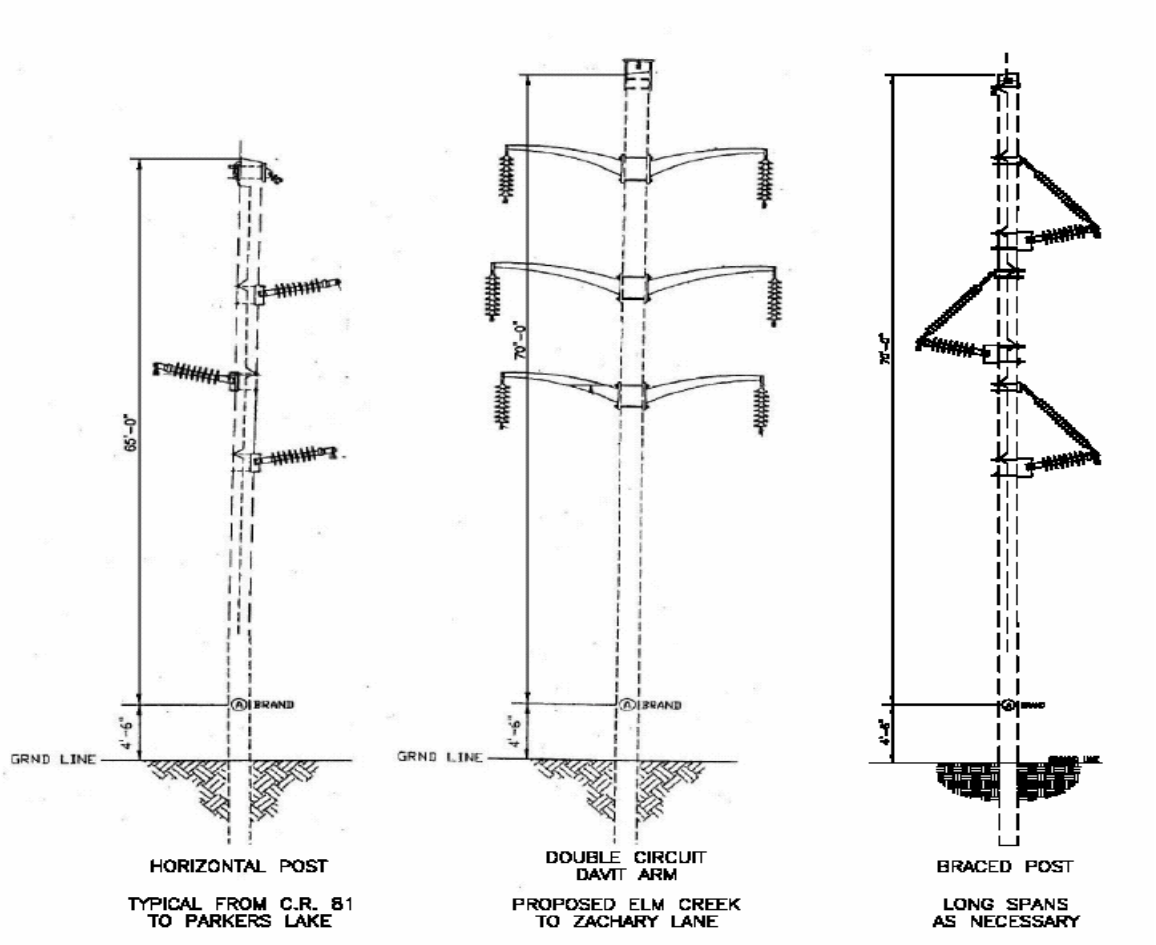


7.18 Material Requirements

The construction of the transmission line will require the use of both renewable and non-renewable resources. The renewable resources consist of the wooden poles and the non-renewable resources consist of insulators, conductors, shield wires, and related hardware.

Schematic diagrams showing dimensions of support structures and conductor configurations for typical support structures that may be used are provided in Figure 7-2. Larger, specially designed structures may be required for specific applications (such as corner structures).

Figure 7-2 Schematic Diagrams of Typical Structures



7.1.8 7.1.9 Distribution System

Substation Upgrades

The proposed project will affect four existing W-H substations (Plymouth, Bass Lake, Cedar Island and Arbor Lake) and one existing Connexus Energy substation (Hennepin). In all cases these substations presently transform the voltage from 69 kV on the transmission side down to 12.47 kV on the distribution side.

W-H and Connexus Energy will replace the existing substation transformers with new ones rated for 115 kV on the incoming side. It may be necessary to make modifications to the substation concrete foundations to support the heavier 115/12.47 kV transformers.

The existing 69 kV transmission line support and termination structures will be modified or replaced to accommodate the 115 kV transmission lines. The transmission structure work may require some modification of the substation fence at the Bass Lake Substation to maintain adequate clearances from the new structures to the fences. There is sufficient space on the substation site property to accommodate the modification and no new land will be purchased. New fencing will match existing fences and interior grade will be even with the existing grade and covered with rock to match the existing area. If it is necessary to uproot any substation screening vegetation, it will be replaced.

Design and construction will be completed in accordance with NESC and RUS standards where applicable.

The substation work will be contracted out to engineering consultants and construction crews.

Distribution Lines

The distribution lines (7.2/12.47 kV) that are attached to the existing 69 kV transmission lines along the proposed route will be converted to underground lines rated for the same voltage. These lines will be installed using industry standard trenching, direct burial, and directional boring underground line construction practices. W–H crews and its contractors will complete this work.

7.2 Electric and Magnetic Fields

The term EMF refers to electric and magnetic fields that are coupled together such as in high frequency radiating fields. For lower frequencies such as for power lines, EMF should be separated into electric fields and magnetic fields. Transmission lines operate at a frequency of 60 hertz (cycles per second), which is in the non-ionizing portion of the electromagnetic frequency spectrum. Fields

are considered ionizing when they cause electrons to eject from their orbits around a normal atom. This will typically occur with frequencies in the range of 10^{16} to 10^{22} hertz.

Magnetic fields result from the flow of electricity (current) in the transmission line. The intensity of the magnetic field is related to the current flow through the conductors. The magnetic field associated with the transmission line surrounds the conductor and rapidly decreases with the distance from the conductor. The value of the magnetic field density is expressed in the unit of gauss (G) or milligauss (mG). The most recent and exhaustive studies of the health effects from power frequency fields conclude that the evidence of health risk is weak.

A sample of magnetic field calculations for years 2005 and 2026 is provided in Figures 7-3 and 7-4. These figures describe magnetic field exposure in a more heavily populated section of the project area (Cedar Island to Bass Lake) during peak conditions with the system intact.

On these figures, the conductors are identified as “A”, “B”, “C”, and “GO”, and are shown on a two-dimensional graph as if they were attached to a pole. The dimension up the right side of the graph is distance in feet above grade and only relates to the height of the conductors. The distance left (negative distance) and right (positive distance) of the center (0’) of the pole is shown at the bottom of the graph.

The figures also show the magnetic field strength (bell shaped curve) measured in mG (the left side of the graph or “B field”). The magnetic field graph shows that the strength of the field increases the closer you are to the center of the transmission line. In this case, the left and right bounds were selected at 100 feet because the field strength from the line is essentially equivalent to other magnetic field background sources at that distance.

The values of the magnetic field are as follows:

- In 2005, the 115 kV transmission line would have a peak value of 18.6 mG directly underneath the transmission line and a value of 10 mG at the edge of the right of way at maximum load conditions.

- In 2026, the 115 kV transmission line will have a peak value of 12 mG directly underneath the transmission line and a value of 6.5 mG at the edge of the right of way under maximum load conditions.

The magnetic field strength will typically increase over time because the power flowing on the line increases. In this installation, the load and magnetic field strength will gradually decrease. Once the 115 kV transmission line is connected between Elm Creek and Parkers Lake, there will be some power transferred from Elm Creek to Parkers Lake. As the load on the line increases, the power transfer

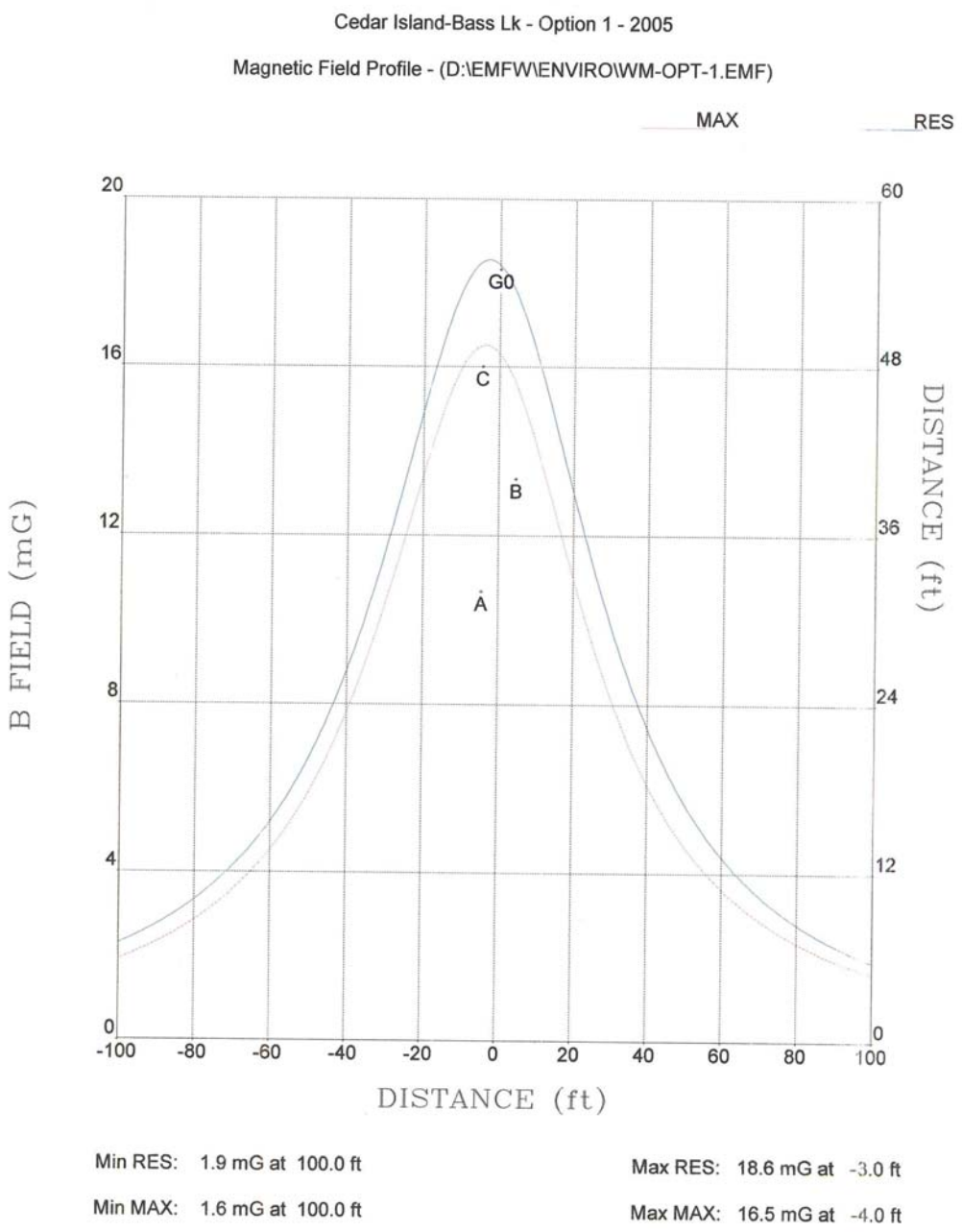


Figure 7-3 Magnetic Field Profile – 2005

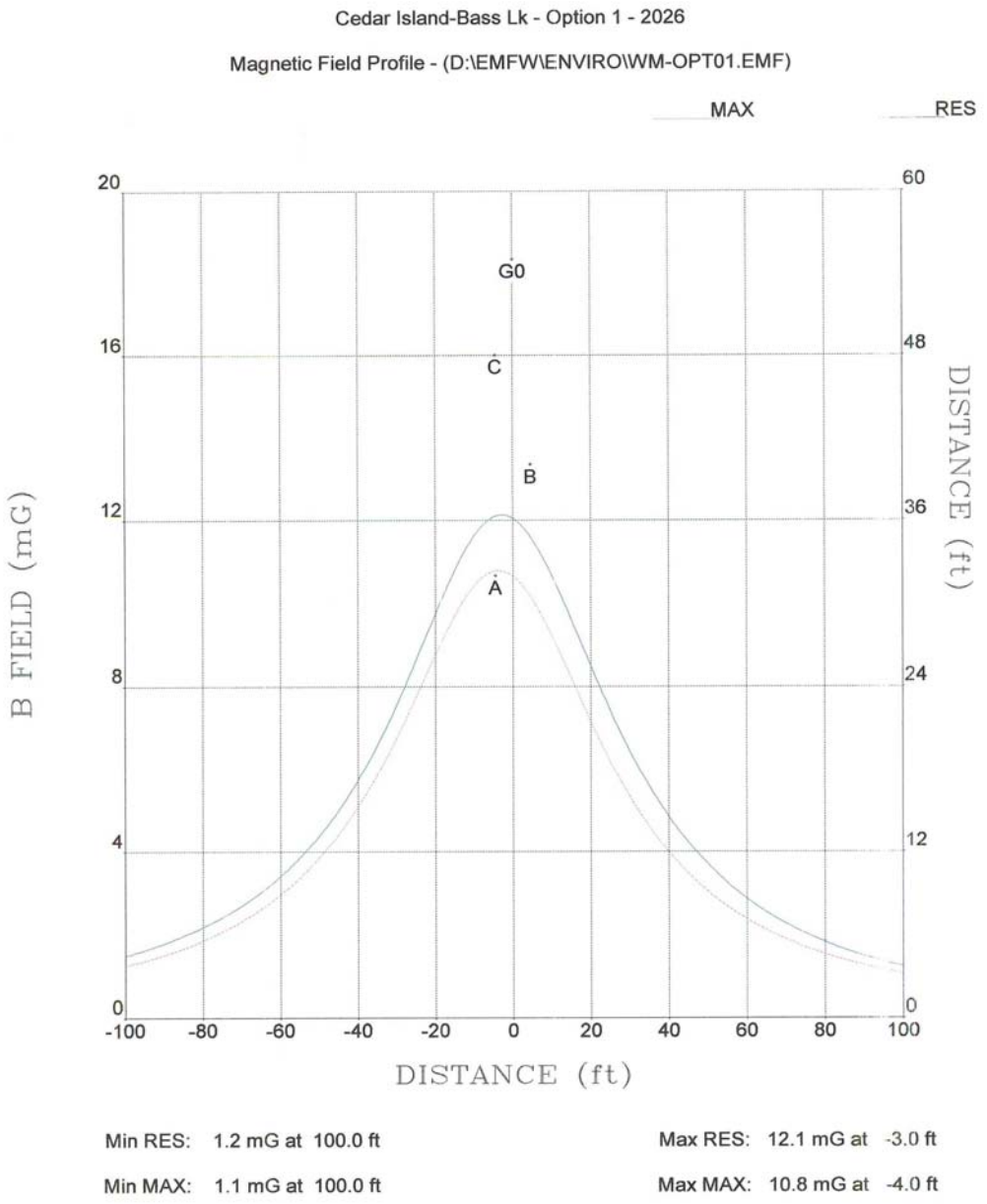


Figure 7-4 Magnetic Field Profile – 2026

will stop, in about the year 2012. After 2014, the proposed 115 kV transmission line will have lower magnetic field strength than the existing 69 kV system.

The voltage in a transmission line generates an electric field, but the magnitude of the electric field rapidly decreases with distance from the conductor. The electric field is expressed in a unit of volts per meter (V/m). Although there is no state or federal standard for transmission line electric field exposures, the EQB has imposed a maximum electric field limit of 8 kV per meter at one meter above ground. That standard was implemented to mitigate serious hazard from shocks when touching large objects parked under transmission lines with voltage of 500 kV or greater. The proposed 115 kV line will have a maximum magnitude of electric field density of approximately 1.1 kV per meter underneath the conductors one meter above ground level. Research on the biological effects from electric fields on animals and humans has shown no significant association with disease in humans.

7.3 Ozone and Nitrogen Oxide Emissions

Corona, which may produce ozone and oxides of nitrogen, consists of an ionic or electrical discharge from the surface of a transmission line conductor. It occurs when the electric field intensity or surface gradient on the conductor exceeds the breakdown strength of air. For a 115 kV transmission line, the conductor surface gradient is usually below the air breakdown level. Some imperfection, such as loose conductor support hardware or water droplets, is necessary to cause corona. When corona occurs, it will be within a few centimeters or less immediately surrounding a conductor. Ozone also forms naturally in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions.

The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Therefore, humidity (or moisture), the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, ozone is relatively short-lived.

On July 18, 1997 the Environmental Protection Agency (EPA) promulgated a regulation (62 Federal Register 38856) replacing the 1-hour ozone 0.12 parts per million (ppm) standard with an 8-hour standard at a level of 0.08 ppm. The form of the 8-hour standard is based on the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area. Calculations using the Bonneville Power Administration *Corona and Field Effects Program Ver. 3* (USDOE, BPA, Undated) for a standard single circuit 115 kV project predicted the maximum concentration of 0.008 ppm near the conductor and 0.003 ppm at one meter above ground during foul weather or worst case conditions with rain at 4 inches per hour. During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0003

ppm near the conductor and 0.0001 ppm at one meter above ground level. For both cases, the ozone levels are below EPA standards.

Most calculations for the production and concentration of ozone assume high humidity or rain with no reduction in the amount of ozone due to oxidation or air movement. These calculations would therefore overestimate the amount of ozone that is produced and concentrated at ground level. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect any increase due to the transmission line facility.

7.4 Radio/TV Interference

The most significant factor with respect to radio and television interference is not the level of the transmission line induced noise, but how it compares with the strength of the broadcast signal. Very few problems have arisen with existing 115 kV transmission line radio noise, as radio stations have adequate signal to noise ratios such that interference is usually not a problem.

If radio interference from transmission line corona does occur with AM radio stations presently providing good reception, satisfactory reception can be obtained by appropriate modification of (or addition to) the receiving antenna system.

Interference with FM broadcast station reception is generally not a problem because:

- corona generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 megahertz (MHz)), and

- the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower. Because no lattice steel towers are anticipated for the proposed 115 kV line, this will not be a problem.

Corona generated radio frequency noise is quite small in the very high frequency (VHF) range used for television transmission. As a result, television interference from corona generated by the proposed 115 kV line will generally be negligible. Noise in the frequency range of cellular type phones is almost non-existent and the technologies used by these devices is superior to that used in two way mobile radio.

Loose and/or damaged hardware may also cause television interference. If television or radio interference is caused by or from the operation of the proposed 115 kV line in those areas where good reception is presently obtained, GRE will inspect and repair any loose or damaged hardware in the transmission line, or take other necessary action to restore reception to the present level, including the appropriate modification of receiving antenna systems if deemed necessary.

8. COST ANALYSIS OF THE PROPOSED ROUTE

8.1 State Approval Costs

GRE estimates that total state approval costs for this project (including the Certificate of Need process and the Route Permit process) will be approximately $1,250,000.

8.2 Construction Costs

The cost estimate for construction of the Plymouth-Maple Grove 115 kV transmission line project is divided into two segments as shown below.

8.2.1 Elm Creek Substation to Plymouth Substation (using existing corridor)

This segment consists of two major components:

- **Elm Creek to GRE's existing 69 kV transmission line at the intersection of Zachary Lane and CR 81**. Xcel Energy is relocating their existing single circuit 115 kV transmission line along CR 81 for changes required due to the reconstruction of CR 81 for the proposed construction of the TH 610 project. This transmission line will be rebuilt to a double circuit transmission line with one circuit dedicated to GRE.

- **Intersection of Zachary Lane and CR 81 to W-H's Plymouth Substation.** The existing 69 kV transmission line will be retired and rebuilt to 115 kV standards to W-H's Arbor Lake, Cedar Island, Bass Lake, and Plymouth substations. The existing overhead distribution line along the route between the Cedar Island and Plymouth substations will be removed and underground distribution line will be installed.

The transmission line estimate is summarized as follows:

GRE Portion of Double Circuit	$ 275,000
Right of Way Clearing Costs	$ 50,000
Material Cost of GRE's Facilities	$ 865,000
Contract Construction Labor Cost	$ 617,000
Retirement Labor Cost	$ 127,000
Land Easement / Damage Costs	$ 640,000
Costs to Underground W-H Lines	$ 453,300
Distribution Substation Modifications	$2,000,000
Cedar Island Bulk Sub Modification	$ 100,000
Elm Creek Line Termination	$ 500,000
Overheads and Miscellaneous Costs	$1,067,000
Total Cost	$6,694,300

Radial Feed to Hennepin Substation

This segment also includes a 0.5 mile radial tap from the intersection of Zachary Lane and CR 81 north to the Connexus Energy Hennepin Substation. This new 115 kV line would follow the existing 69 kV line along the west side of Zachary Lane. The existing 69 kV transmission line will be retired and rebuilt to 115 kV standards, and a three-way switch would be installed at the line tap point.

Note: This cost is shown as a planning estimate cost because Connexus Energy has not finalized a date for the conversion of the Hennepin Substation from 69 kV to 115 kV. GRE's cumulative estimated planning cost for the radial feed is:

Total Cost	$ 197,500

8.2.2 Plymouth Substation to Parkers Lake Substation (requiring new corridor)

The final transmission line segment is between W-H's Plymouth Substation south to Xcel Energy's Parkers Lake Substation. The summary of costs for this segment is as follows:

Material Cost of GRE's Facilities	$ 731,000
Contract Construction Labor Costs	$ 364,000
Right of Way Clearing Costs	$ 35,000
Land Easement / Damage Costs	$2,055,000
Parkers Lake Substation Modifications	$ 500,000
Overheads and Miscellaneous Costs	$ 788,200
Total Cost	$ 4,473,200

The total cost for construction of the transmission line project is estimated to be approximately $11,365,000.

The estimated engineered project costs shown above are higher than the estimated project planning costs provided in the Certificate of Need Application (GRE and W-H, 2002). The estimated project cost estimates, as shown in the Certificate of Need Application, were planning costs that were based on 2002 unit pricing from historical data, not on actual engineered costs nor on a specific route. To the extent that the cost increase is the result of higher actual material and higher installation costs that the historical costs, the actual engineered costs for all three of the transmission alternatives (Options 2-4), as listed in the Certificate of Need Application, would have risen in a similar manner.

8.3 Operation and Maintenance Costs

Annual operation and maintenance costs associated with 115 kV transmission lines in GRE's system have averaged approximately $ 1000 per mile of line over the last several years. Costs of operation account for approximately 43% of those costs, and include such items as switching actions, air patrol, and surveying. The remaining 57% of those costs is maintenance and includes tree clearing, right of way spraying, and structure inspections.

9. DESCRIPTION OF DESIGN OPTIONS TO ACCOMMODATE FUTURE EXPANSION OF THE HVTL

The GRE transmission planning timeframe presently extends out to 2026. During this timeframe, GRE does not have any plans to expand the proposed Plymouth-Maple Grove 115 kV line, nor is GRE aware of any other utility plans to expand the 115 kV line. The design plans are therefore based on the current project and do not include any future expansion of the HVTL.

10. RIGHT OF WAY ACQUISITION AND RESTORATION

10.1 Right of Way Requirements

The proposed route for GRE's 115 kV transmission line will utilize an existing 69 kV corridor between the Hennepin and Plymouth substations. For many portions of this route, GRE already holds easement rights at least 70 feet in width, which would, in most areas, be adequate for construction of the proposed 115 kV line.

It should be noted that for the portion of the proposed 115 kV line that is to be built as a double circuit line (between the Elm Creek Substation and GRE's existing line at the intersection of CR 81 and Zachary Lane), the right of way width could be different depending upon the type of structure used and upon Xcel Energy's requirements. One potential route for this segment may not require private right of way because it would be located along a highway and railroad corridor.

10.2 Right of Way Acquisition Procedures

Once approvals from various state, federal and local agencies, and governmental units are secured, land rights acquisition will commence. Land rights include easement acquisition in the case of a transmission line, or acquisition of a fee interest in the case of a substation or breaker station. As a general practice, landowners will be contacted to review project details and to discuss the initial phase of the transmission project, including survey and soil investigation. Upon completion of the survey and preliminary design, landowners will be contacted and easement/fee acquisition negotiations will commence.

For much of the proposed route, GRE and/or Xcel Energy have existing easement rights that are proposed to be utilized. For these areas, GRE will thoroughly review all existing easements from a legal standpoint, to determine whether or not the existing easements include adequate rights for the construction of the proposed 115 kV line. It is GRE's preliminary opinion that such rights do exist, but it is possible that particular provisions have been inserted in isolated easements, thus requiring a more detailed legal analysis.

In cases where additional rights are determined to be necessary, customary acquisition procedures will be followed for the acquisition of these rights. In cases where the existing rights are determined to be adequate, the affected property owners will be contacted and provided with a copy of the existing easement rights and explanation of GRE's intentions regarding use of these rights. GRE Right of Way representatives will be available and willing to discuss easement issues with all owners regardless of whether or not additional easement rights are necessary.

During the acquisition phase of the project, landowners are given a copy of the conveyance documents generally including easements, deeds, structure design or photos, offer sheets, and a plan showing the proposed transmission line or facility relative to the landowner's property. Additional information may also be given to each landowner explaining powerline safety, easement acquisition procedures, and damage settlement. In addition to permanent easements necessary for the construction of the line, temporary easements may be obtained from certain landowners for temporary construction, access, or staging areas for temporary storage of poles, vehicles, or other related items. Landowners will be notified in the event site access for soil boring is required to determine soil suitability in areas where certain soil characteristics may require special transmission structure design.

10.3 Tree Clearing and Staking

After land rights have been secured, landowners will be contacted to discuss the initial construction phase of the project including schedules, ingress and egress to and from the planned facility, tree and vegetation removal, damage mitigation, and other related construction activities.

The first phase of construction activities will involve surveying the centerline of the new transmission line, followed by removal of trees and other vegetation from the right of way. As a general practice, low-growing brush or tree species are allowable at the outer limits of the easement area. Taller tree species that endanger the safe and reliable operation of the transmission facility are removed. In developed areas and to the extent practical, existing low growing vegetation that will not pose a threat to the transmission facility or impede construction will remain in the easement area.

The second phase of construction will involve staking the location of structures, followed by structure installation and stringing of conductor wire.

10.4 Right of Way Restoration

Upon completion of construction activities, landowners will be contacted to determine whether or not construction damages have occurred. Areas that sustain construction damage will be restored to their pre-construction condition to the extent possible. Landowners will be notified of the completion of the project, and asked to report any outstanding construction damage that has not been remedied or any other issue related to the construction of the transmission line. Once construction cleanup is complete and construction damages have been successfully mitigated, landowners will be sent a final contact letter signaling the close of the project and requesting notification of any outstanding issues related to the project.

11. CONSTRUCTION PRACTICES AND OPERATION AND MAINTENANCE OF THE HVTL

11.1 Construction Practices

General

The proposed 115 kV transmission line would be constructed at existing grade elevations. Therefore, no pole locations would require grading, unless it is necessary to provide a level area for construction access and activities.

GRE designs and constructs transmission lines using the most cost-effective methods based on past experiences and practices and in compliance with the latest industry standards. As an RUS borrower, GRE adheres to RUS standards regarding clearances to ground, clearance to crossing utilities, clearance to buildings, right of way widths, erecting power poles, and stringing of transmission line conductors. RUS requires borrowers to submit an environmental report prior to any construction activities.

GRE typically utilizes outside contractors for construction activities on large transmission line projects. The specifications used are developed by GRE's Engineering Services Department, which utilize the RUS contract documents and standards. A copy of GRE's easement restriction list and any required local permits are given to the awarded contractor prior to construction.

Typical tangent structures will be wood, laminated wood, or steel direct-embedded poles. The structures will require a hole dug 10 to 15 feet deep with 3 to 4 feet diameter for each pole. Any excess soil will be removed from the site unless requested by landowners or others. The poles may be backfilled with native soils, crushed rock, or concrete depending on design conditions. In lowland areas, a galvanized steel culvert may also be inserted for pole stability due to poor soil capacity. Large angle structures will typically be self-supporting steel poles that will require a drilled pier foundation. The piers will typically have diameters of 4 to 8 feet. The hole may require a typical depth of 15 to 30 feet deep depending on design requirements. The piers will be filled with concrete delivered to the site via concrete trucks from a local batch plant.

Poles may be delivered to the staked location or to a designated marshalling yard depending on delivery and contractor availability. If the poles are delivered to a staked site, they are placed on the right of way out of the clear zone of any adjacent highways or designed pathways. The poles are typically framed with insulators and hardware on the ground, and then lifted and placed in the hole via a bucket truck or a crane, depending on the weight of the structure.

Once the structures have been erected, conductors are installed by establishing stringing setup areas within the right of way. These stringing setup areas are typically located every two miles along the project route. The conductors are pulled with a rope lead that connects to every structure through a dolly attached at the insulator location. Temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions after any necessary notifications are made or permit requirements met to mitigate any concerns with traffic flow or operations of other utilities.

In lowland areas, construction activities may occur during the winter season to mitigate any damage to wetland areas or to comply with required crossing permits. A pre-construction conference will outline any special requirements for the contractor prior to the start of any construction activities.

During construction, when temporary removal or relocation of fences may occur, installation of temporary or permanent gates may be required. GRE right of way agents will coordinate with the landowners on replacement of fences and gates. As part of GRE's easement restriction list, the contractor will work around cultivated areas until harvest has occurred.

Rebuilt Lines

Rebuilding existing transmission lines will typically involve complete replacement of structures and conductors. Procedures would be similar to those discussed above for the proposed project. Increased voltage or current requirements will result in increased phase spacing or larger cables. The transmission line will typically be rebuilt in the same right of way. However, because of the voltage increase, the right of way width will need to be evaluated for proper clearances. Compact designs can sometimes mitigate the need for additional right of way for voltage upgrades.

Substation Upgrades

The proposed project will affect four existing W-H substations (Plymouth, Bass Lake, Cedar Island, and Arbor Lake) and one existing Connexus Energy substation (Hennepin). In all cases, these substations presently transform the voltage from 69 kV on the transmission side down to 12.47 kV on the distribution side.

For the proposed project, W-H and Connexus Energy would need to replace the substation transformers to accept the higher incoming 115 kV voltage and transform 115 kV down to 12.47 kV. It would also be necessary to replace or modify the existing 69 kV transmission line support and termination structures. Because the distribution voltage remains at 12.47 kV, it would not be necessary to do any construction work on the distribution side of the substations.

W-H is also an RUS borrower. All construction will be completed in accordance with RUS construction standards as well as the National Electric Safety Code (NESC). These standards include clearances to ground, clearance to crossing utilities, clearance to buildings, right of way widths, erecting power poles, and stringing of transmission line conductors. RUS requires borrowers to submit an environmental report prior to any construction activities.

Connexus Energy is not an RUS borrower, but its construction practices still conform to RUS construction standards as well as NESC standards. Environmental reports are also filed prior to construction activities.

It may be necessary to make modifications to the substation concrete foundations to support the heavier 115/12.47 kV transformers. It will also be necessary to replace some of the transmission line support and termination structures located on the substation sites to accommodate the higher voltage and in some cases the installation of circuit breakers or switches.

The transmission line work may require some expansion of the substation sites to maintain adequate clearances from the new structures to fences. In all cases, there is sufficient space on the substation site property to accommodate the fenced area expansion and no new land will be purchased. Any new fencing will match existing fences and the interior grade will be even with the existing grade and covered with rock to match the existing area. If it is necessary to uproot any substation screening vegetation, it will be moved or replaced.

The substation work will be contracted out to engineering consultants and construction crews, because as primarily distribution voltage-based companies, neither W-H nor Connexus Energy have transmission line construction crews. Copies of required local permits will be provided to contractors prior to construction.

11.2 Operation and Maintenance

GRE will periodically use the transmission line right of way to perform inspections, maintenance of the equipment, and repair of any damage. Regular maintenance and inspections will be performed over the life of the facility to ensure a reliable system. Annual inspections will be done by foot, snowmobile, All-Terrain Vehicles (ATV), pickup truck, or by aerial means. These inspections will be limited to the acquired right of way and areas where obstructions or terrain require access off the easement. An aerial inspection of each transmission line is conducted monthly to ensure reliable operation.

GRE's Construction and Customer Service Department will conduct vegetation surveys and remove undesired vegetation that will interfere with the operation of the transmission line. Frequency of vegetation maintenance is on a two to five

year cycle. Right of way clearing practices include a combination of mechanical and hand clearing, along with an application of herbicides where allowed.

11.3 Work Force Requirements

During construction, there will be minimal impacts to community services, hotels and restaurants to support the utility personnel and contractors. It is estimated that 15 to 25 workers will normally be employed during the project.

It is not expected that additional permanent jobs would be created during the construction of this project. The construction activities would provide seasonal influx of additional revenue into the communities during the construction phase, and materials such as concrete may be purchased locally.

12. LIST OF PERMITS NEEDED

12.1 Local

City and County Road Crossing Permits

These permits are required to cross or occupy city and county road right of way.

City or County Lands Permits

These permits may be required to occupy city or county lands such as parklands, watershed districts, and other city/county-owned property.

Building Permits

Building permits may be required by the local jurisdictions for substation modifications associated with the proposed transmission line project.

12.2 State

Certificate of Need

A utility must obtain a Certificate of Need from the Minnesota Public Utilities Commission for any large high voltage transmission line of 10 miles or longer in length.

Route Permit

A utility must obtain a Route Permit from the Minnesota Environmental Quality Board to construct a high voltage transmission line.

Licenses to Cross Protected Waters

The Minnesota Department of Natural Resources has identified protected waters and wetlands in the state for which a license to cross must be obtained.

Road Crossing Permits

Permits from the Minnesota Department of Transportation are required to cross or occupy state trunk highway road right of way.

State Lands Permits

These permits may be required to occupy state-owned property.

12.3 Federal

Rural Utilities Service Approval

A utility that requests financial assistance from the Rural Utilities Service must demonstrate environmental compliance and obtain environmental approval prior to construction of a transmission line.

13. SUMMARY OF FACTORS TO BE CONSIDERED IN EVALUATING THIS APPLICATION

Before a Route Permit may be granted, the Minnesota Public Utilities Commission must determine that a 115 kV HVTL is needed to meet the energy needs of W-H customers located in the Plymouth-Maple Grove community. The HVTL's two endpoints will be the Xcel Energy Elm Creek and Parkers Lake substations. Between those two endpoints, the HVTL must interconnect with the Connexus Energy-owned Hennepin Substation and the W-H Arbor Lake, Cedar Island, Bass Lake, and Plymouth substations.

The role of the EQB is to determine the best route to follow to accomplish those requirements, and to determine what mitigation efforts GRE and W-H should employ to reduce any environmental consequences. Minn. Rules pt. 4400.3150 lists 14 factors to consider in determining whether to issue a permit for the proposed route. Those factors, and a brief summary with respect to each follows:

A. Effects on human settlement, including but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.

The proposed route results in no displacement of existing residences. The noise from the HVTL is minimal, as described in Section 5.2.3 of this Application. Most of the proposed line will replace an existing 69 kV line, and is as, or more, aesthetic as the existing 69 kV line. The proposed route for the HVTL will have no impact on cultural values, recreation, or public services.

B. Effects on public health and safety.

The HVTL will be constructed to comply with Rural Utilities Service (RUS) as well as the National Electric Safety Code (NESC).

The HVTL meets the EQB standard imposing a maximum electric field limit of 8 kV per meter at one meter above ground. That standard was implemented to mitigate serious hazard from shocks when touching large objects parked under transmission lines with voltage of 500 kV or greater. The proposed 115 kV line will have a maximum magnitude of electric field density of approximately 1.1 kV per meter underneath the conductors one meter above ground level. Research on the biological effects from electric fields on animals and humans has shown no significant association with disease in humans.

Magnetic fields result from the flow of electricity (current) in the transmission line. The most recent and exhaustive studies of the health effects from power frequency fields conclude that the evidence of health risk related to magnetic

fields weak. The values of the magnetic field for the 115 kV transmission line are as follows:

- In 2005, the 115 kV transmission line would have a peak value of 18.6 mG directly underneath the transmission line and a value of 10 mG at the edge of the right of way at maximum load conditions.

- In 2026, the 115 kV transmission line will have a peak value of 12 mG directly underneath the transmission line and a value of 6.5 mG at the edge of the right of way under maximum load conditions.

The magnetic field strength will typically increase over time because the power flowing on the line increases. However, in this installation, the load and magnetic field strength will gradually decrease. Once the 115 kV transmission line is connected between Elm Creek and Parkers Lake, there will be some power transferred from Elm Creek to Parkers Lake. As the load on the line increases, the power transfer will stop, in about the year 2012. After 2014, the proposed 115 kV transmission line will have lower magnetic field strength than the existing 69 kV system.

C. Effects on land-based economies, including but not limited to, agricultural, forestry, tourism, and mining.

The proposed route for the HVTL does not cross any prime agricultural, forestry or mining property, nor is the route located in an area where tourism would be affected.

D. Effects on archaeological and historic resources.

The proposed route does not include any archaeological or historical resources.

E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.

The HVTL will not effect air or water quality. It will only affect flora within the easement area. There are limited fauna in this very urban route, and they will not be affected by the HVTL.

F. Effects on rare and unique natural resources.

There are no rare or unique natural resources within the proposed route.

G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission capacity.

There are no known, or likely plans to add additional transmission capacity along the proposed route. Therefore, the design is appropriate to this project and maximizes energy efficiency. In addition, GRE will work with the affected landowners to use a design that mitigates the impact on the affected landowners and the right of way.

H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries.

The proposed route uses the existing 69 kV route and its right of way, along with the existing 115 kV route and right of way from Elm Creek to GRE's existing facilities at the intersection of CR 81 and Zachary Lane. The proposed route uses an existing Xcel Energy route and its right of way along I-494 for a portion of the line between the Plymouth and Parkers Lake substations. Other portions of the existing Xcel Energy route that could otherwise be used for the Plymouth to Parkers Lake segment are not feasible because it is not possible to add an additional 115 kV line to the existing Xcel Energy facilities, and encroachments into the right of way easement would not permit the safe and economical installation of the 115 kV HVTL within that easement. However, the proposed route for this portion of the Plymouth to Parkers Lake segment largely parallels the I-494 right of way corridor.

I. Use of existing large electric power generating plant sites.

This criterion is not applicable.

J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.

See the comments under part H above.

K. Electrical system reliability.

In addition to the proposed route, four alternate routes were identified for the portion of the line between the Elm Creek and Plymouth substations. All of the alternatives would require radial feeds from the main 115 kV line to one or more of the substations. A radial feed to a substation decreases reliability, in that a single contingency on the radial feed would cause an outage to the entire area served by the affected substation. One of the alternatives would also require developing an entirely new corridor, which would be inconsistent with the policy

against nonproliferation identified in subpart J above, and as articulated by the Supreme Court in *PEER v. MEQB*, 266 N.W. 2d 858 (1978).

L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.

The cost of constructing, operating, and maintaining the facility along the proposed route is no higher, and is likely to be lower than along alternative routes. The proposed route relies on existing rights of way to the extent technically and economically feasible. This reduces the cost of acquiring easements, and right of way preparation. The alternative that would attempt to force the line onto the full length of the existing Xcel Energy right of way between the Plymouth and Parkers Lake substations would increase construction costs, as it would be necessary to install taller poles, have very long spans between poles, and include changes in direction (with attendant higher costs) to avoid the safety risks caused by the numerous encroachments into the existing right of way.

M. Adverse human and natural environmental effects which cannot be avoided.

The only identified environmental effects that cannot be avoided are primarily short-term during the construction of the line. If any archeological sites are identified during placement of the poles along the proposed route, the particular site will be avoided and the poles placed outside the specified buffer zone. Native vegetation will be maintained within the proposed route that is compatible with the operation and maintenance of the transmission line. If necessary, native species will be planted or seeded in areas that are devoid of native species. Soils will be revegetated as soon as possible to minimize erosion or some other method will be used during construction to prevent soil erosion. During construction temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions after any necessary notifications are made or permit requirements met to mitigate any concerns with traffic flow or operations of other utilities.

N. Irreversible and irretrievable commitments of resources.

The proposed route does not require any irreversible or irretrievable commitment of resources. Should the line be abandoned and removed at some time in the future, there is nothing related to its earlier placement that would prevent or require a different use of resources in the future.

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